Volume 15 Number 1 (2023)
January-June 2023
Page: 701-714

E-ISSN: 2656-9779
P-ISSN: 1907-6355
DOI: 10.37680/qalamuna.v15i1.3924

QALAMUNA
JURNAL PENDIDIKAN, SOSIAL, DAN AGAMA

Potential Sustainability Scenarios for Gringsing Weaving in Bali, Indonesia: How Important is Education?

I Gusti Ayu Agung Virna Pryanka [1], Ida Ayu Nyoman Saskara [2]

[1] Udayana University, Bali, Indonesia; igaavirnapc@gmail.com
[2] Udayana University, Bali, Indonesia; saskara@unud.ac.id

Received: 20/06/2023 Revised: 18/09/2023 Accepted: 21/10/2023

Abstract

The Gringsing weaving craft industry in Karangasem, Bali, Indonesia, is a culture-based creative industry with its values and characteristics as a local cultural heritage with innovation and creativity important for developing countries and economic growth. With the rapid modernization of technology, Bali Aga ethnic weavers must adapt to changing times by improving education, skills, and knowledge to maintain the continuity of local traditions. This research aims to determine the probability scenarios for weaving sustainability in Tenganan Pegringsingan Village, Karangasem. This research is quantitative, with primary data from the results of FGDs with experts who will later determine probability scenarios for sustainability. Researchers will place more emphasis on educational probability scenarios to improve the skills and knowledge of artisans. The analysis technique used is SMIC-Prob analysis. The analysis results show that of the five scenarios formulated, there is the best combination with a probability of 0.104, namely the scenario of artisans producing as usual, opening a fashion stall, increasing production, and increasing knowledge. The conclusion of the sensitivity of the scenario shows the highest elasticity in the sustainability of Gringsing weaving by realizing an educational scenario to increase skills and knowledge of 1.102. It can be concluded that the sustainability of weaving is determined mainly by the educational scenario to improve the skills and knowledge of artisans. Training programs and instilling character values as support for weaving artisans need to be improved to maintain the sustainability and development of the weaving.

Keywords Gringsing Weaving; Continuity; Education

Corresponding Author
I Gusti Ayu Agung Virna Pryanka
Udayana University, Bali, Indonesia; igaavirnapc@gmail.com

1. INTRODUCTION

Karangasem, as one of the administrative regions of Bali, Indonesia, is full of cultural-based textile industries such as *endek, songket,* and *gringsing*. Data (BPS Karangasem Regency, 2021) shows the number of industries in 2016 (last data updated 2/11/2019) was 14,846, an increase from 2015 of 14,699(Statistik, 2019). One of the Karangasem cultures in Tenganan Pegringsingan village is Gringsing weaving, a legacy of past generations from a combination of elements of traditional art technology and is well known internationally. This woven fabric is a textile product derived from the creativity of the people of Tenganan Pegringsingan Village.

Gringsing is a woven fabric characterized by techniques, colours, motifs, and noble meanings(Lodra, 2015). The uniqueness of its attraction is combined in a piece of Gringsing Woven Cloth. Etymologically, Gringsing comes from the word "Gering," which means disease, and "Sing," which means non-existent. So, Gringsing Cloth has the meaning and function of being a medium for repelling disease(Utami, 2015). Gringsing woven cloth is an aesthetic work full of meaning as a symbol believed to have spiritual power by indigenous peoples, which reflects the religious function of Gringsing cloth, which tends to be strong and not limited to body protection. Furthermore, as a work of art, Gringsing Woven Cloth goes through a dyeing process by being tied tightly. This technique then reflects the characteristic that Gringsing Weaving is a double ikat weave that is not owned by any community in Indonesia and takes years for just one piece of cloth. Double ikat weaving binds and unifies nature and noetic to create harmony(Lodra, 2015).

During the COVID-19 pandemic, the economic sector has become one of the most challenging and unavoidable sectors, including for indigenous communities who own land in the traditional tourism sector, such as Tenganan Pegringsingan. Restrictions on visitors from outside the region, including various policies, both total and semi-lockdown measures, also significantly impact the community. This situation significantly impacts gringsing weaving artisans in Tenganan Pegringsingan Village. They are haunted by uncertainty regarding the sale of ikat fabrics. Their sales gradually decreased, resulting in a decrease in production and income. In 2021, the Minister of Tourism and Creative Economy (Menparekraf), Sandiaga Salahuddin Uno, ordered 120 Gringsing weavings to be presented to world leaders attending the November 2022 G20 meeting in Bali. This weaving order revealed that he could employ 400 artisans in Tenganan Village, Manggis District, Karangasem Regency, Bali Province. This number is almost the same as the population of Tenganan Village. Especially during the pandemic, this order means a lot to the artisans(Bangsa, 2021).

Gringsing weaving can be said to be a culture-based creative industry. Cultural industries provide symbolic, authentic, historical, and aesthetic meaning from cultural values to certain cultural products and visual attributes**(Fahmi & Dijk, 2016)**. One strategy for the sustainability of culture-based creative industries is economic activities that combine a cultural approach, namely cultural values and creative industries, which are closely related to innovation, creativity, and copyright **(Lampel et al., 2000; Lawrence & Phillips, 2002; Peris-Ortiz et al., 2019)**. As already mentioned**(Anugerah & Prasetia, 2015)**. Through creative activities that utilize local cultural resources, it is hoped that we will be able to preserve culture sustainably. One of the Sustainable Development Goals (SDGs) goals is to improve the quality of learning(Aji et al., 2022). Efforts and community involvement are needed to preserve and develop local characteristics so that foreign cultural invasions do not erode them.

The creative industry culture of connecting traditional knowledge with innovation and creativity is essential for several countries because it has economic potential and impacts economic development(Pessoa et al., 2009) (Peris-Ortiz et al., 2019) **(Kostis, 2021; Westwood & Low, 2003)**. For example, handicrafts in the cultural industry play an essential role in people's income and job creation and have been recognized throughout the world alleviation**(Balaji & Mani, 2014)**.

In addition, according to Cooke & de Propris, the cultural industry has deep roots in local values . It allows the diversification of rural economic activities sustainably and wisely. **(Cooke & Propris, 2011)**.

However, Y. Yang et al., 2018, which studies the sustainability and preservation of traditional craft cultural industries that have cultural capital, is still not much, and most research focuses on the sustainability and preservation of tangible cultural heritage among other historical buildings. remains or archaeological sites**(Hou & Chan, 2017)**. Meanwhile, in some countries, the output of the cultural industry is a unique, significant cultural heritage safely pursued to fulfil cultural and economic goals for sustainable development (A.A. N. Anom Mayun, 2015) (Throsby, 2014). Meanwhile, Nugroho's research results show that the technology that accompanies the Industrial 4.0 era provides opportunities that can be exploited for the development of creative industries, even though there are challenges faced, such as limited human capabilities, resources, copyright problems, infiltration of foreign cultures and creativity which is still low. his confession(Nugroho, 2019).

Gringsing preservation is achieved by integrating cultural knowledge with rules and verifying design applications. The natural colouring process in gringsing weaving is relevant to environmental and cultural aspects(Widiawati et al., 2012). However, the obstacles artisans face, apart from the problem of raw materials, especially threads, are complicated, the dyeing process is long, and the development of factory-made fabrics resembling *gringsing*, which is destroying the market, is spreading on the market, threatening environmental sustainability of Balinese woven cultural products, including gringsing. This phenomenon will significantly affect prices and trigger a flood of counterfeit goods.

Modernization with technology and information is developing rapidly (Rabie, 2016; Sekhar et al., 2022). It is feared that it could change people's mindset regarding developing their regional culture(Yamin, 2019). Bali Aga ethnic weavers must fight the current of changing times and protect their traditions so that they are not eroded(Sudarmanto, 2022). Rural communities who do not have good knowledge have to face the fact that access to technology and training is still unequal(Sarah, 2022). In this case, artisans need educational development by increasing weaving skills and knowledge. Education aims to encourage creativity in a mindset that supports the growth of charity and work in the creative industry (Choi, 2020; Henriksen et al., 2018). The role of research is to provide input on creative industry development policy models and the instruments needed and to produce technology that supports working methods and efficient use of resources and makes the national creative industry competitive. Community service's role is to form a society with institutions/social order that supports the growth of the national creative industry**(Sulastri & Dilastri, 2015)**.

Previous research by Saraswati et al. (2023) stated that authenticity and social media influence the sustainability of the Gringsing Weaving Industry(Saraswati et al., 2023). This argument is supported by the results of research by Sudarmanto (2002), which states the existence of Gringsing Bali weaving in Tenganan village by teaching weaving skills to the younger generation, especially those living there. (Sudarmanto, 2022). With previous research stating the advantages of each variable, the sustainability of gringsing weaving requires scenario analysis to determine potential scenarios as the best steps in the sustainability of gringsing weaving. This finding can be known using SMIC-Prob analysis to determine the probability scenario for the sustainability of Grinsing ikat weaving in Tenganan Village.

With the uniqueness and attractiveness of gringsing woven fabric that needs to be preserved, based on the results of the Focus Group Discussion (FGD), there are five main scenarios, namely 1) continuing to produce as usual, 2) apart from production, other businesses such as opening a fashion stall, 3) increasing production, 4) apart from producing, they also open other businesses outside the gringsing weaving industry such as Banten businesses, food stall businesses, and 5) improving weaving skills and knowledge. In this research, researchers will emphasize educational probability scenarios to improve the skills and knowledge of artisans. Training programs and instilling character education to love one's own culture as support for gringsing weaving artisans need to be improved to maintain the sustainability and development of gringsing weaving for the sustainability of weaving in Tenganan Pegringsingan Village Karangasem scenario.

2. METHODS

The research location is Tenganan Pegrisingan Village, Karangasem Regency, Bali, and will be carried out in 2023. The sample was taken from 50 per cent of weavers from around 150 weaving artisans, namely 75 artisans plus related elements, to make 120 respondents whose results were used as a comparison with the results of the Focus Group Discussion (FGD) with Gringsing weaving experts, as well as 19 stakeholders totalling 19 respondents. The strategy design model carried out for the sustainability of gringsing weaving by including aspects of uncertainty is by SMIC-Prob-Expert. Based on probability theory, this method assesses the possibility of an activity occurring. SMIC-Prob then calculates a combination of scenario scores that may or may not be implemented (Fauzie, 2019). combinations are generated based on the number of scenarios or events observed with a combination of r = 2n, where n is the number of scenarios observed. Determining various event scenarios is based on the opinions of gringsing weaving experts carried out through FGD or filling out questionnaires, which can be written: H= (e1, e2, …. en), where e1 - en means an event or activity. FGD also determines simple probability (P(i), the conditional probability of each scenario in the form of:

$\boldsymbol{P} = (\boldsymbol{i}/\boldsymbol{j})$ =*probability of scenario i if scenario j is accurate*

$\boldsymbol{P} = (\boldsymbol{i}/\bar{\boldsymbol{j}})$ =*probability of scenario i if scenario j does not occur*

SMIC-prob also requires requirements for every opportunity to operate, namely:

$$0 \leq P(i) \leq 1$$
$$P(i/j)P(j) = P(j/i)P(i) = P(ij)$$
$$P(i/\bar{j})P(j) + P(i/\bar{j})\,P(\bar{j}) = P(i) \qquad (1)$$

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

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

With constraints:

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

"πk" symbol describes the probability scenario k, whose value is sought from the minimization solution above. The value of t(ijk) will be equal to 1 if events i and j occur in scenario k, and 0 if 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. Completion of the quadratic program produces probability scores from highest to lowest, which are presented in tabular form, as well as probability elasticity values for each event in the form:

$$e_{ij} = \frac{P(i)\Delta P(j)}{P(j)\Delta P(i)} \qquad (3)$$

In FGD, the experts determine the hypothesised probability based on their responses' appropriateness or considerations. Uncertainty analysis with SMIC-Prob has several stages to produce a combination of scenarios. Generally, this stage concerns collecting information on the sustainability of the observed gringsing weaving, data analysis, and interpretation of the results. Figure 1 below shows experts' determination of opportunities, which is the determining step in producing analysis results, where the second and third stages are the main components of the SMIC-Prob analysis stage.

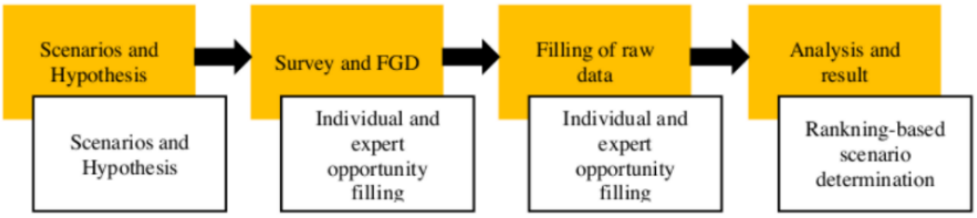


Figure 1. SMIC-Prob Analysis Stages (Fauzi, 2019)

3. FINDINGS AND DISCUSSIONS

Based on the SMIC-Prob analysis stage, the initial stage is to identify the probability scenario to be analyzed. The scenarios in this research are possible actions of gringsing weaving artisans in production. Based on the results of the questionnaire, which were adapted to the results of the FGD, there are five scenarios (in the SMIC-Prob data input, they are called hypotheses), which were identified for the sustainability of the gringsing weaving industry, namely: (1) continuing to produce as usual, (2) in addition to producing opening other businesses such as opening a shop, fashion (commercial), (3) increasing production, (4) apart from producing, also opening other businesses outside the gringsing weaving industry such as Banten businesses, food stall businesses (side economy), and (5) increasing weaving skills and knowledge (education).

SMIC-Prob Analysis Results

a. Scenario for Determining the Probability of Sustainability of Gerinsing Weaving

Calibration from raw data to clean data is the initial process of SMIC-Prob analysis so that the data becomes more accurate so that simple and conditional probability data from raw data is recalculated into clean data. Calibration results from raw data to simple opportunity data for ikat weaving craftsmen's action scenarios according to Figure 2:

	Probabilities
1 : Usual	0,4
2 : Commercial	0,6
3 : Increase	0,35
4 : SideEco	0,55
5 : Education	0,65

© LIPSOR-EPITA-PROB-EXPERT

	Probabilities
1 : Usual	0,413
2 : Commercial	0,518
3 : Increase	0,434
4 : SideEco	0,474
5 : Education	0,662

© LIPSOR-EPITA-PROB-EXPERT

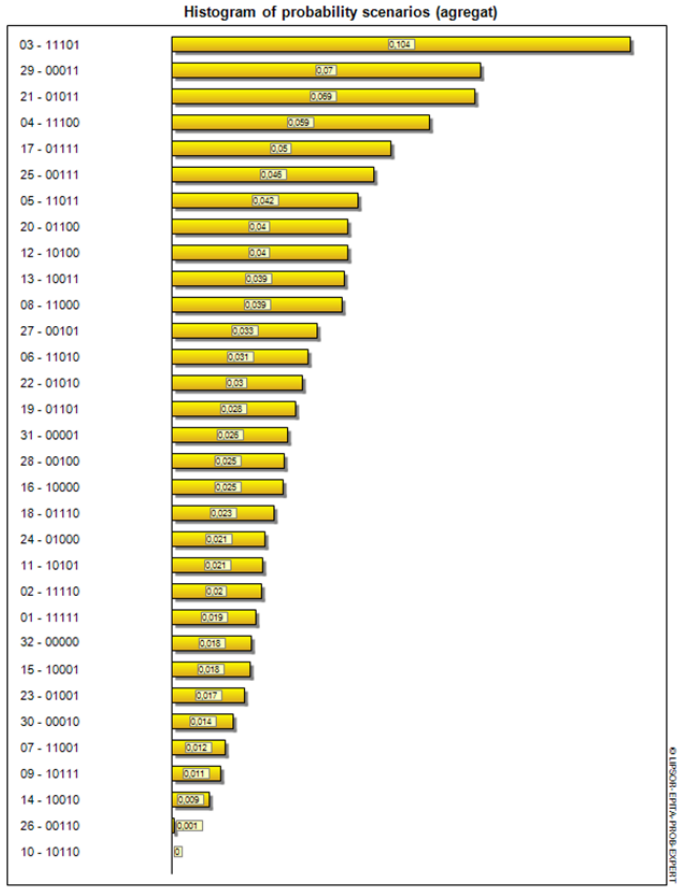
Figure 2. Simple Probability of Raw Data and Clean Data (Pi)

The change in raw data to clean data on simple occasions, according to Figure 2, shows that artisans continue to produce as usual, from 0.4 (40%) to 0.413 (41.3%) after calibration. There is a scenario that shows a decrease in opportunities, namely that artisans besides producing also open fashion stalls decreased from 0.6 (60%) to 0.518 (51.8%), and the actions of artisans besides producing also open other businesses from 0.55 (55%) up to 0.474 (47.4%).

To see the ranking of possible scenario combinations, which produces 2n combinations where n in this study is five possible scenarios, there are 32 scenario combinations, as shown in Figure 3. The numbers "1" and "0" in each combination indicate whether the scenario is realized. No. As in the results of Figure 3 (a), the lowest combination is 10110, which has a chance of 0 (0%), meaning that the combination of scenarios hypothesized by artisans is to continue producing as usual, increase production, and the artisans's actions apart from production are also to open another business without

opening a stall. Fashion (commercial) and not improving skills and knowledge (education) have little chance of being implemented.

	agregat
1 : 11111	0,019
2 : 11110	0,02
3 : 11101	0,104
4 : 11100	0,059
5 : 11011	0,042
6 : 11010	0,031
7 : 11001	0,012
8 : 11000	0,039
9 : 10111	0,011
10 : 10110	0
11 : 10101	0,021
12 : 10100	0,04
13 : 10011	0,039
14 : 10010	0,009
15 : 10001	0,018
16 : 10000	0,025
17 : 01111	0,05
18 : 01110	0,023
19 : 01101	0,028
20 : 01100	0,04
21 : 01011	0,069
22 : 01010	0,03
23 : 01001	0,017
24 : 01000	0,021
25 : 00111	0,046
26 : 00110	0,001
27 : 00101	0,033
28 : 00100	0,025
29 : 00011	0,07
30 : 00010	0,014
31 : 00001	0,026
32 : 00000	0,018



A B

Figure 3. (a) Probability of Different Scenarios and (b) Measure of Probability of Combination Sequences Based on Scenarios

Meanwhile, the one with the highest probability of an alternative combination is combination 03, namely 11101, which is 0.104 (10.4%), which means that in this combination scenario, artisans continue to produce as usual, apart from producing as usual, there is also a fashion stall business (commercial), increasing production (increase), and increase in skills and knowledge (education) by 10.4%. This number can be explained based on the results of questionnaires, FGDs, and in-depth interviews with elders (senior experts). It can be seen that the artisans maintain hereditary traditions, and some artisans follow tourism developments. There are essential visits, such as the Minister of Tourism and the G20 Presidency. Apart from that, based on the results of the FGD, training in developing woven fabric production designs using weaving techniques and management development can increase the income of artisans in Tenganan Village.

b. Scenario Analysis of Sensitivity Drivers of Sustainability in the Gringsing 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 research are shown in Figure 4, where the last column is the absolute value of the elasticity for each scenario (horizontal summation), which can be interpreted as the "prime mover" or main driver of the existing system. Analyzed. Meanwhile, the last line (vertical addition) is a scenario or conditional action.

	Usual	Commercial	Increase	SideEco	Education	Absolute value
1 : Usual	1	-0,161	-0,183	-0,237	-0,279	1,039
2 : Commercial	-0,154	1	-0,163	-0,15	-0,25	0,648
3 : Increase	-0,195	-0,169	1	-0,288	-0,227	0,864
4 : SideEco	-0,299	-0,152	-0,288	1	-0,066	0,556
5 : Education	-0,35	-0,3	-0,266	-0,031	1	1,102
6 : Absolute value	0,999	0,604	0,851	0,506	1,248	_

Figure 4. Elasticity Scenario

Elasticity analysis clearly shows the sensitivity of one scenario to another, whether the artisans's actions are the "main driver" or a contributor to the sustainability of Gringsing weaving. As usual, increasing the skills and knowledge of weaving artisans and production is a "prime mover" with elasticities of 1.102 and 1.039, respectively, which means the sustainability of gringsing weaving will be better, significantly **determined by** both scenarios. Indeed, artisans survive to continue producing as usual, which is the most common thing. It is the result of work handed down from generation to generation by their ancestors. Therefore, increasing skills and knowledge in weaving makes it easier for artisans to work. On the other hand, in the last line, the scenario of increasing weaving skills and knowledge is greatly influenced by an elasticity of 1.248, which is the most significant contributor to education, namely -0.237, which can be said if the opportunity for artisans to produce as usual increases by 100%, then the opportunity for artisans to increase their skills and knowledge weaving will decrease by 0.237 (23.7%).

Here, the senior artisans will survive and continue to choose authenticity and history, even if it is commodified, without reducing the sacredness of Gringsing woven cloth. As (Lodra, 2015), (Parameswara et al., 2022) (and Anugerah & Prasetia, 2015) argue, economic activities make Geringsing cloth experience commodification of meaning by artisans, designers, and creators but do not abandon its cultural values. It is contained therein. He believes that commodification has a role in preserving and developing Gringsing weaving. However, its sacredness is still strong, as seen in making Geringsing, materials, motifs, accompanying rituals, ethics, and beliefs.

According to Sudarmanto (2022), there is great encouragement from the older generation to continue to preserve Balinese Gringsing weaving by teaching weaving skills and knowledge to the younger generation, especially those living in rural areas. Can stop efforts by outside parties to speed up the Gringsing weaving production process by imitating original woven motifs on other types of fabric with different materials and dyes or synthetic dyes. So, as a precaution against the threat of people outside Tenganan Pegringsingan village to produce Gringsing Bali weaving illegally, which could result in a decline in the quality and reputation of Gringsing Bali weaving. Increasing skills and knowledge influence the sustainability of gringsing weaving, which is supported by the results of research from (Seminary et al., 2019), which states that training in developing Pegringsingan cloth production in Tenganan Village, Manggis District, Karangasem Regency has had a positive impact on the community because it has gained much knowledge in developing woven fabric production through design diversification, business management so that it can improve management in the fields of marketing, production and finance, increase competitiveness in the market, and of course increase the weavers' income.

A table can be used to see further the sensitivity analysis results regarding the most likely scenarios and what opportunities exist between implementation and non-implementation. The data is presented in Table 1. A recapitulation of each scenario shows that increasing artisans' skills and knowledge is the scenario with the highest overall chance, namely 0.605 or 60.5%.

Table 1. Recapitulation of Opportunities for Each Scenario

No.	Normal	Commercial	Increase	SisiEco	Education	Opportunity
1	1	1	1	1	1	0.019
2	1	1	1	1	0	0.02
3	1	1	1	0	1	0.104
4	1	1	1	0	0	0.059
5	1	1	0	1	1	0.042
6	1	1	0	1	0	0.031
7	1	1	0	0	1	0.012
8	1	1	0	0	0	0.039
9	1	0	1	1	1	0.011
10	1	0	1	1	0	0
11	1	0	1	0	1	0.021
12	1	0	1	0	0	0.04
13	1	0	0	1	1	0.039
14	1	0	0	1	0	0.009
15	1	0	0	0	1	0.018
16	1	0	0	0	0	0.025
17	0	1	1	1	1	0.05
18	0	1	1	1	0	0.023
19	0	1	1	0	1	0.028
20	0	1	1	0	0	0.04
21	0	1	0	1	1	0.069
22	0	1	0	1	0	0.03
23	0	1	0	0	1	0.017
24	0	1	0	0	0	0.021
25	0	0	1	1	1	0.046
26	0	0	1	1	0	0.001
27	0	0	1	0	1	0.033
28	0	0	1	0	0	0.025
29	0	0	0	1	1	0.07
30	0	0	0	1	0	0.014
31	0	0	0	0	1	0.026
32	0	0	0	0	0	0.018
	0.489	0.604	0.52	0.474	**0.605**	1.00

Table 2 presents a combination of scenarios for weavers increasing production between realized (with code "1" at the end) and unrealized (code "O" at the end). Stratigea et al. (2010) and Stratigea and Papadopoulou (2013) have also used this presentation technique.

Table 2. Comparison of Educational Realization

No.	Scenario Combination	Educational Opportunities= 1	No.	Scenario Combination	Educational Opportunities = 0
1	"11111"	0.019	2	"11110"	0.02
3	"11101"	0.104	4	"11100"	0.059
5	"11011"	0.042	6	"11010"	0.031
7	"11001"	0.012	8	"11000"	0.039
9	"10111"	0.011	10	"10110"	0
11	"10101"	0.021	12	"10100"	0.04
13	"10011"	0.039	14	"10010"	0.009
15	"10001"	0.018	16	"10,000"	0.025
17	"01111"	0.05	18	"01110"	0.023
19	"01101"	0.028	20	"01100"	0.04
21	"01011"	0.069	22	"01010"	0.03
23	"01001"	0.017	24	"01000"	0.021

No.	Scenario Combination	Educational Opportunities= 1	No.	Scenario Combination	Educational Opportunities = 0
25	"00111"	0.046	26	"00110"	0.001
27	"00101"	0.033	28	"00100"	0.025
29	"00011"	0.07	30	"00010"	0.014
31	"00001"	0.026	32	"00000"	0.018
	Total	**0.605**		**Total**	**0.395**

Based on Table 2, the odds between realizing an increase in skills and knowledge (0.605) versus not realizing it (0.395) are greater if it is realized. This shows the importance of increasing skills and knowledge in weaving because gringsing weaving has high cultural value. It also has an economic value, which is no less important for the local community's income.

Discussion

There are five scenarios (in the SMIC-Prob data input called hypotheses) identified for the sustainability of the gringsing weaving industry, namely: (1) continuing to produce as usual, (2) apart from producing, also opening other businesses such as opening a shop, fashion (commercial), (3) increasing production, (4) apart from producing, also opening other businesses outside the gringsing weaving industry such as Banten businesses, food stall businesses (side economy), and (5) increasing weaving skills and knowledge (education). Furthermore, from the five scenarios, the sustainability of gringsing weaving was determined mainly by the educational scenario to improve the skills and knowledge of artisans.

Education, in this case, plays a vital role in maintaining cultural values (Abbott, 2017; Branco, 2018; Payne & O'Neil, 2019)while improving the skills and knowledge of artisans. This understanding will help artisans develop, innovate, and continue their cultural traditions while ensuring that their work remains relevant and can compete in an increasingly global marketplace, which aligns with Nahak's research results, which state that efforts to maintain and preserve Indonesian culture can be done in two ways. That is cultural experience and cultural knowledge. Nahak further explained that various efforts can be made to preserve local culture, including Raising awareness about the importance of culture as a national identity by taking part in preserving culture by participating in its preservation and implementation, studying it, and socializing it with other people so that they are interested in protecting or preserving it and even defending it. (Nahak, 2019).

In line with character education theory, which emphasizes the importance of teaching values such as integrity, hard work, perseverance, and responsibility(Abbott, 2017; Arthur & Harrison, 2023; Baehr, 2017) (Agus, 2021). In the context of Gringsing Weaving, improving skills and knowledge can also be linked to developing character values. For example, efforts to improve weaving skills reflect artisans's hard work and perseverance. Character education also includes respect for local wisdom and cultural heritage. Gringsing weaving is a valuable cultural heritage, and efforts to improve the skills and knowledge of artisans can help maintain and respect this tradition. Character education is about theory and practice (Arthur & Harrison, 2023; Hidayat et al., 2022; Jerome & Kisby, 2019; Sakban & Sundawa, 2023). Increasing the skills and knowledge of artisans in the Gringsing Weaving production process can also teach values such as collaboration, innovation, and a sense of responsibility. Character education theory emphasizes balancing academic, moral, and skills(Hasanah et al., 2022; Hikmasari et al., 2021; Rahmadani et al., 2021) (Muchtar & Suryani, 2019). In the context of Gringsing Weaving, character education can integrate moral aspects (respect for cultural heritage) and skills (development of weaving techniques) to achieve sustainability. Character education often emphasizes the importance of educating the younger generation. In the context of Gringsing Weaving, education can provide opportunities for the younger generation to understand and inherit this tradition, maintaining the industry's sustainability so that comprehensive character education is needed from home to community. (Agus, 2021).

The potential for sustainability of Gringsing Weaving to improve the skills and knowledge of artisans in the context of Gringsing Weaving can be achieved through skills education and the application of character education. This scenario can be done by teaching cultural heritage. Artisans must understand and respect the cultural values, history, and meaning of Gringsing weaving, which involves a deep understanding of the traditional processes, motif symbolism, and stories behind the Gringsing weaving cloth. Technical Skills Development: apart from respect for culture, artisans must continue developing their technical skills in weaving. Structured and ongoing training can help them improve weaving techniques, become familiar with the materials and tools used, and master efficient production processes. Development of Character Values: during the training process, it is crucial to integrate the development of character values into learning. These include hard work, perseverance, integrity, and a sense of responsibility. For example, artisans can be taught to appreciate the hard work and dedication required in running the Gringsing Weaving industry. Collaboration and Innovation: Character education also includes the development of values such as collaboration and innovation. Artisans must be taught to work together to create new designs, develop better techniques, and create innovative products. Collaboration with fellow artisans or designers can broaden your horizons and help market your products. Responsibility for Sustainability: One crucial aspect of character education is a sense of responsibility for sustainability. Artisans must understand the importance of maintaining environmental sustainability and sustainable practices in the Gringsing Weaving industry, including using environmentally friendly materials and responsible production practices. Young Generation Education character education must also include the education of the younger generation in the family and school environment. The younger generation must be allowed to learn about Gringsing Weaving, its cultural values, and the technical skills required. This movement can create the next generation who cares about cultural heritage and has the skills to continue the gringsing weaving industry.

4. CONCLUSION

The research results concluded that the sustainability of gringsing weaving is determined mainly by educational scenarios to improve the skills and knowledge of artisans. Training programs and instilling character values as support for gringsing weaving artisans need to be improved to maintain the sustainability and development of gringsing weaving. The government can also support research and training on gringsing weaving techniques and design innovation so that this tradition remains relevant to modern market tastes without losing its essence. Character education emphasizes the importance of achieving a balance between academic, moral, and skills aspects; implementing character education that integrates respect for culture, skills development, and the formation of strong character values, artisans in the Gringsing Weaving industry can improve their ability to maintain industrial sustainability while respecting cultural heritage and innovating in production. This strategy also helps ensure that the industry remains relevant and competes in an increasingly global marketplace.

REFERENCES

A.A Ngr, Anom Mayun K. Tenaya. (2015). Komodifikasi Kain Tenun Songket Bali Di Tengah Perkembangan Industri Kreatif Fesyen di Denpasar. Documentation. ISI Denpasar.

Abbott, A. (2017). Indonesian Identity and Cultural Values. In A. Abbott (Ed.), *Educational Sovereignty and Transnational Exchanges in Post-Secondary Indonesian Education* (pp. 135–161). Springer International Publishing. https://doi.org/10.1007/978-3-319-53985-0_6

Agus, W. (2021). *Pentingnya Pendidikan Karakter dalam Dunia Pendidikan*. 4(5), 2077–2081.

Aji, S. D., Yasa, A. D., Dewi, P. K., Kumala, F. N., & Putri, A. N. (2022). Pengembangan E-Module Flipbook Pembelajaran IPA untuk Mendukung Tujuan Pembangunan Berkelanjutan (SDGs) bagi

Siswa Sekolah Dasar. *QALAMUNA: Jurnal Pendidikan, Sosial, Dan Agama*, *14*(2), 895–906.

Anugerah, A., & Prasetia, A. R. (2015). Potensi Industri Kreatif Tekstil Berbasis Budaya Lokal Sebagai Konfigurasi Revolusi Mental Dan Fortifikasi Branding Untuk Destinasi Pasar Internasional. In *Paramadina Research Day 2015, Masa Depan Manusia Indonesia: Prospek dan Pemberdayaan*. https://doi.org/10.13140/RG.2.1.2313.9928

Arthur, J., & Harrison, T. (2023). Transforming the Theory and Practice of Character Education. In T. Lovat, R. Toomey, N. Clement, & K. Dally (Eds.), *Second International Research Handbook on Values Education and Student Wellbeing* (pp. 267–277). Springer International Publishing. https://doi.org/10.1007/978-3-031-24420-9_14

Baehr, J. (2017). The Varieties of Character and Some Implications for Character Education. *Journal of Youth and Adolescence*, *46*(6), 1153–1161. https://doi.org/10.1007/s10964-017-0654-z

Balaji, N. C., & Mani, M. (2014). Kelestarian alat tenun tradisional. *Jurnal Teknik Dan Manajemen Lingkungan*, *13*(2), 323–331 10 30638 2014 037.

Bangsa, R. P. (2021). Sandiaga Uno Pekerjakan Semua Pengrajin Tenun Desa Tenganan. In *Gatra*.

Branco, A. U. (2018). Values, Education and Human Development: The Major Role of Social Interactions' Quality Within Classroom Cultural Contexts. In A. U. Branco & M. C. Lopes-de-Oliveira (Eds.), *Alterity, Values, and Socialization: Human Development Within Educational Contexts* (pp. 31–50). Springer International Publishing. https://doi.org/10.1007/978-3-319-70506-4_2

Choi, J. (2020). How Creative Mindset Operates with Respect to Creative Performance: Pedagogical Factors that Ignite Creative Mindset in Design Education. In A. G. Ho (Ed.), *Advances in Human Factors in Communication of Design* (pp. 13–22). Springer International Publishing.

Cooke, P., & Propris, L. (2011). Agenda kebijakan untuk pertumbuhan cerdas UE: Peran industri kreatif dan budaya. *Studi Kebijakan*, *32*(4), 365–375 10 1080 01442872 2011 571852.

Fahmi, F. Z., & Dijk, J. (2016). *Industri kreatif dan pembangunan ekonomi regional di Indonesia: makna, pola dan dampak* (p. 161).

Hasanah, A., Arifin, B., Mahyani, A., & Saepurahman, A. (2022). Landasan Teori Pendidikan Karakter. *Jurnal Sains Sosio Humaniora*, *6*, 725–736. https://doi.org/10.22437/jssh.v6i1.20165

Henriksen, D., Henderson, M., Creely, E., Ceretkova, S., Černochová, M., Sendova, E., Sointu, E. T., & Tienken, C. H. (2018). Creativity and Technology in Education: An International Perspective. *Technology, Knowledge and Learning*, *23*(3), 409–424. https://doi.org/10.1007/s10758-018-9380-1

Hidayat, M., Rozak, R. W. A., Hakam, K. A., Kembara, M. D., & Parhan, M. (2022). Character education in Indonesia: How is it internalized and implemented in virtual learning? *Cakrawala Pendidikan*, *41*(1), 186–198. https://doi.org/10.21831/cp.v41i1.45920

Hikmasari, D., Susanto, H., & Syam, A. (2021). Konsep Pendidikan Karakter Perspektif Thomas Lickona dan Ki Hajar Dewantara. *AL-ASASIYYA: Journal Of Basic Education*, *6*, 19–31. https://doi.org/10.24269/ajbe.v6i1.4915

Hou, J., & Chan, E. H. W. (2017). Policy Approaches For Sustainable Conservation Of Built Heritage Using Transfer Of Development Rights: International Comparison. *Sustainable Development*, *25*(6), 528–545. https://doi.org/10.1002/sd.1676

Jerome, L., & Kisby, B. (2019). Theorising Character Education. In L. Jerome & B. Kisby (Eds.), *The Rise of Character Education in Britain: Heroes, Dragons and the Myths of Character* (pp. 9–28). Springer International Publishing. https://doi.org/10.1007/978-3-030-27761-1_2

Kostis, P. C. (2021). Culture, innovation, and economic development. *Journal of Innovation and*

Entrepreneurship, *10*(1), 22. https://doi.org/10.1186/s13731-021-00163-7

Lampel, J., Lant, T., & Shamsie, J. (2000). Balancing act: Learning from organizing practices in cultural industries. *Organization Science*, *11*(3), 263–269.

Lawrence, T. B., & Phillips, N. (2002). Understanding cultural industries. *Journal of Management Inquiry*, *11*(4), 430–441.

Lodra, D. I. (2015). *Di Balik Kain Tenun Gringsing Tenganan, Karangasem*. Werdi Sila Kumara Silakarang.

Muchtar, D., & Suryani, A. (2019). *Pendidikan Karakter Menurut Kemendikbud (Telaah Pemikiran atas Kemendikbud)*. *3*(2), 50–57.

Nahak, H. M. I. (2019). Effort To Preserve Indonesian Culture In The Era Of Globalization. *Sosiologi Nusantara*, *5*(1), 65–76. https://doi.org/DOI ://doi.org/10.33369/jsn.5.1.65-76

Nugroho, M. T. (2019). Industri Kreatif Berbasis Budaya Peluang Dan Tantangan Di Era Industry 4.0. In *Seminar Nasional IENACO: Industri Kreatif Berbasis Budaya Pada Era Industri 4.0* (Issue 7, pp. 430–436).

Payne, L., & O'Neil, J. K. (2019). Cultural Sustainability in Higher Education. In W. Leal Filho (Ed.), *Encyclopedia of Sustainability in Higher Education* (pp. 1–7). Springer International Publishing. https://doi.org/10.1007/978-3-319-63951-2_109-1

Peris-Ortiz, M., Gomez, J. A., & López-Sieben, M. (2019). Cultural and Creative Industries: An Overview. In M. Peris-Ortiz, M. R. Cabrera-Flores, & A. Serrano-Santoyo (Eds.), *Cultural and Creative Industries: A Path to Entrepreneurship and Innovation* (pp. 1–13). Springer International Publishing. https://doi.org/10.1007/978-3-319-99590-8_1

Pessoa, J., Deloumeaux, L., & Ellis, S. (2009). *Kerangka kerja Unesco untuk statistik budaya (FCS) tahun 2009*. Institut Statistik Unesco.

Rabie, M. (2016). *A theory of sustainable sociocultural and economic development*. Springer.

Rahmadani, E., Armanto, D., Safitri, E., & Umami, R. (2021). Ontologi, Epistemologi, Aksiologi dalam Pendidikan Karakter. In *Journal of Science and Social Research* (Issue 3). http://jurnal.goretanpena.com/index.php/JSSR

Sakban, A., & Sundawa, D. (2023). Character Education : Direction and Priority for National Character Development in Indonesia. *Jurnal Kependidikan: Jurnal Hasil Penelitian Dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran Dan Pembelajaran*, *9*, 794. https://doi.org/10.33394/jk.v9i3.7843

Sarah, N. (2022). Eksklusif Sosial Ketimpangan Pendidikan di Masa Pandemi Covid-19 Melalui Kegiatan Digitalisasi Pendidikan. *QALAMUNA: Jurnal Pendidikan, Sosial, Dan Agama*, *14*(2), 263–274.

Saraswati, I. G. A. P., Saskara, I. A. N., & Setyari, N. P. W. (2023). Analisis Variabel Kunci untuk Keberlanjutan Industri Tenun Geringsing Double Ikat di Desa Pegeringsingan. *Jurnal Ilmu Sosial Dan Humaniora*, *12*(1), 73–85. https://doi.org/10.23887/jish.v12i1.53598

Sekhar, S. R. M., Chaturvedi, A., & Thakur, A. M. (2022). Modernization and Innovative Development in Society 5.0. In K. G. Srinivasa, G. M. Siddesh, & S. R. Manisekhar (Eds.), *Society 5.0: Smart Future Towards Enhancing the Quality of Society* (pp. 13–34). Springer Nature Singapore. https://doi.org/10.1007/978-981-19-2161-2_2

Statistik, B. P. (2019). *Statistik Daerah Kabupaten Cilacap*. BPS Kabupaten Karangasem.

Sudarmanto, I. G. (2022). Eksistensi Tenun Gringsing Bali Dalam Era New Normal Pandemi Covid-19. *Journal of Comprehensive Science (JCS)*, *1*(3), 216–227. https://doi.org/10.36418/jcs.v1i3.46

Sulastri, R. E., & Dilastri, N. (2015). Peran Pemerintah Dan Akademisi Dalam Memajukan Industri Kreatif Kasus Pada UKM Kerajinan Sulaman Di Kota Pariaman. In *Seminar Nasional Ekonomi Manajemen Dan Akuntansi (SNEMA) Fakultas Ekonomi Universitas Negeri Padang* (Issue c, pp. 87–94).

Throsby, D. (2014). Modal budaya dan keberlanjutan. *Ekonomi Dan Budaya*.

Utami, S. (2015). Tenun Gringsing Orelasi Motif, Fungsi, Dan Arti Simbolik. *Imaji*, *12*(1), 1–7. https://doi.org/10.21831/imaji.v12i1.3632

Westwood, R., & Low, D. R. (2003). The multicultural muse: Culture, creativity and innovation. *International Journal of Cross-Cultural Management*, *3*(2), 235–259.

Widiawati, D., Sn, S., Sn, M., Rosandini, M., & Ds, S. (2012). Pewarna Alami Pada Tekstil Tradisional Indonesia - Studi Kasus: Kain Tenun Gringsing Di Desa Tenganan Pegringsingan Bali. *Jurnal Penelitian Budaya Kostum*, *20*(1), 111–120 10 7741 2012 20 1 111.

Yamin, M. (2019). Information technologies of the 21st century and their impact on the society. *International Journal of Information Technology*, *11*(4), 759–766. https://doi.org/10.1007/s41870-019-00355-1