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Advances in Science, Technology & Innovation  
IEREK Interdisciplinary Series for Sustainable Development

Muhammad Nawaz Tunio · Jorge Miguel Chica Garcia ·  
Ayman M. Zakaria · Yasmin Moanis Latif Hatem *Editors*

# Sustainability in Creative Industries

Innovations in Fashion and Visual Media—  
Volume 3

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# Advances in Science, Technology & Innovation

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Muhammad Nawaz Tunio ·  
Jorge Miguel Chica Garcia · Ayman M. Zakaria ·  
Yasmin Moanis Latif Hatem  
Editors

# Sustainability in Creative Industries

Innovations in Fashion and Visual  
Media—Volume 3

A culmination of selected research papers  
from the International Conference on  
Sustainability in Creative Industries (SCI),  
Universitas Ciputra 2022

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## Preface

Long-term sustainability is a spark of the green economy which comes up with solid solutions to limited resources. Sustainability, with lenses to the Agenda of UN with its 17 SDGs, manages social, economic as well as environmental perspectives of the globe. Sustainable approach is mandatory; however, the sustainability in long term is possible through the diffusion of the innovation because the innovation is heart of the suitability. Innovation and creativity are the essential in all fields so creativity and sustainability are important and necessary segments of human life for their survival. Creativity is deep rooted in different practices of the culture, social, economic, and environment. Therefore, it is essential to mitigate the barriers of affordability, scalability, replicability, and sustainability so that the combination of the creativity and sustainability which can be approached from the different perspectives of thematic, disciplinary, trans-disciplinary, intercultural way. Creativity paves way for the all kinds of the development including the creative intelligence. Creative intelligence is new and dynamic field of knowledge, which empowers the potential of create, connect, and inspire. The combination of creativity and artistic manifestation postulates inspiration, energy, and empowerment. Design is important perspective of the creativity as well as culture.

After the adoption of emerging technologies, cultural industries are transformed into the creative industries with more modernity and economic growth. Cultural industries pave the way for the creation, production, and commercialization which results in creative content. The outcome of the creative industries appears in different versions such as journalism, studios of the artists, studios of design, architectural offices, media production, film houses, and cinema.

Thus, this book focuses on all perspectives as discussed above and touches on the new zone of knowledge.

Bhitshah, Pakistan

Muhammad Nawaz Tunio

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# Innovation in Processing Rudraksha into Contemporary Sustainable Accessories with the ATUMICS Method

Elliaty Djakaria, Isabella I. Andreas, and Seriwati Ginting

## Abstract

Rudraksha (*Jenitri/Elaeocarpus ganitrus*) is a kind of seed from Rudraksha tree that is often used in Asia, especially in India, Indonesia, and Pakistan. It is commonly used as accessories, complements to religious rituals, and musical instruments. Based on various studies, Rudraksha has medical and spiritual benefits. However, not many contemporary accessories are made from Rudraksha nowadays. In general, trendy accessories on the market do not use natural materials and are not durable even though they have beautiful designs and low prices. Poor quality accessories add to the garbage pile and harm the environment. For this reason, continuous and sustainable efforts should start from the farmers and gatherers of Rudraksha until Rudraksha accessories designer/producer so that the making of Rudraksha accessories has a positive impact on the environment, society, and even the economy. This study used a descriptive qualitative method by comparing and analysing the innovation during the processing of Rudraksha accessories especially necklace made by a MSME called LORI (Laras Ornamen Indonesia) using the ATUMICS (Artefact, Technique, Utility, Material, Icon, Concept, and Shape) method of Adhi Nugraha. In addition, the researchers were conducting observations with farmers and gatherers of Rudraksha from Pengaringan, Central Java-Indonesia, craftsperson, designer, MSME owner,

and academics from Bandung, West Java-Indonesia. The innovations made by the artisans succeeded in changing the position of the Rudraksha accessories, which was previously considered an outdated accessory into a contemporary one that has more function and value. Innovations in environmentally friendly colouring, modern designs according to trends, and an integrated sales system until the international level can empower the community so it can improve the society's economic condition. Based on these findings, we can see that if everybody involved in processing Rudraksha accessories uses the green economy concept correctly, it can increase the value, attractiveness, and acceptance level of traditional materials like Rudraksha.

## Keywords

Green economy · Necklace · *Jenitri* · *Elaeocarpus ganitrus* · MSME

## 1 Introduction

The development of trends, changes in economic conditions, and changes in public awareness regarding environmental issues today are some factors influencing why people shop for fashion products. The discussion of fashion products in this research is accessories, especially necklaces that use Rudraksha as the primary material. One of the authors, who has and still in the beadwork business (the art or craft of stringing beads together using thin threads or wires), tries to find innovations, so that fashion accessories with Rudraksha material become part of a sustainable creative industry. The researcher's field experience shows that the Rudraksha accessories in Indonesia are made by both large and small and medium enterprises. Still, the choice of materials has a lot of negative impacts on the environment.

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The most widely used material is plastic beads, which are not durable. Based on these observations and the effect, the choice finally fell on Rudraksha. Rudraksha tends to have a beautiful, durable shape. It can be assembled with several other materials that can also be coloured according to taste so that it has more added value.

Rudraksha contains healthy compounds such as phosphorus, manganese, iron, magnesium, nickel, and copper. Therefore, it is good to use it as a herb by brewing it like drinking tea. Various studies also strengthen the belief that Rudraksha is good for physical and mental health. People believe that Rudraksha provides calmness, improves blood pressure and circulation, repairs mental and nervous disorders, and nourishes the heart. They had many benefits because of their electric and diamagnetic properties (Naresh et al., 2013).

Indonesia is the largest producer of Rudraksha, which is 70% of all world production (Ministry of Trade of the Republic of Indonesia, 2017). Rudraksha belongs to the *Elaeocarpaceae* family and grows widely in Sumatra, Kalimantan, Bali, and Kebumen (Central Java). Currently, only Kebumen is intensively developing and making Rudraksha as souvenirs in the form of necklaces, bracelets, *tasbih*, and bags. One of the authors is the designer and owner of LORI accessories, which became the main object of this research. She arranges Rudraksha into necklace pendants with various designs, shapes, and sizes. Suhas Roy research from Benaras Hindu University proved that Rudraksha has electrochemical and physical properties in induction, capacitance, and electromagnetics. Therefore, Rudraksha can affect the central brain when used to produce bio electrochemical stimuli (Sharma et al., 2022).

Accessories are one kind of fashion product that enhances people's look. Nowadays, there are not many contemporary accessories made from Rudraksha. Some contemporary accessories made from Rudraksha are shown in Figs. 11.1 and 11.2.

Nature's shape and form inspired this necklace pendant made from Rudraksha and metal. People buy it for fashion purposes.

Even though this necklace design is not for praying, people still relate it to spiritual things because of Rudraksha's benefit.

In general, trendy accessories on the market do not use natural materials and are not durable even though they have beautiful designs and low prices. Poor quality accessories add to the garbage pile and harm the environment. Accessories from beads sometimes made from cheap plastic or other materials are not durable and harmful for the environment.

Fashion is regarded as being the pacemaker of social change and always had close ties with modern capitalism. It tends to boost consumerism if the people and society



**Fig. 11.1** The latest design from LORI. (Source Research Team, 2023)



**Fig. 11.2** Rudraksha necklace with gold or metal plating. (Source Gurvir Singh, 2022)

cannot control it. The price and quality of fashion products are dropping and encouraging the consumers to buy more than they should be. The low price is appealing for consumers who are yearning for happiness, because it makes them the feeling that they are saving money and becoming more fashionable (Schulze & Banz, 2015). This phenomenon is worrisome since we should be more responsible for the impact to the society and the earth. For this reason, continuous and sustainable efforts should start from the farmer and collector of Rudraksha until Rudraksha accessories craftsperson so that the making of Rudraksha accessories has a positive impact on the environment, society, and even the economy.

The uniqueness of Rudraksha as accessories material, its health benefit, and its potential to become fashion product make it a great product for sustainable MSME. The researchers view sustainability in four domains: ecology, economics, politics, and culture that intersect with other social conditions (James et al., 2015). Green Economy acts as an 'umbrella' concept for this MSME because it acknowledges the underpinning role of all ecological processes. It is not only resource-focused like Circular Economy and Bioeconomy (D'Amato et al., 2017). An inclusive green economy improves human well-being and builds social equity. At the same time, it reduces environmental risks and scarcities (UNEP, 2011). Rudraksha is a renewable resource and has a nature-based solution, so it matches with the green economy principle if used for accessories industry. Those concepts also match Indonesia

slow fashion strategies such as keeping the tradition, taking local ideas and resources and return to contribute on global movement, and making quality products to avoid excessive dispose and consumptions (Murwanti, 2017).







The purpose of this paper is to analyse Rudraksha accessories, especially the ones that were produced by LORI using the ATUMICS method. LORI (Laras Ornamen Indonesia) is a MSME in Indonesia that focused on making fashion accessories (necklace, bracelet, brooch, earrings, etc.) using natural materials. This method is developed by Adhi Nugraha and it is the abbreviation of Artefact (A), Technique (T), Utility (U), Material (M), Icon (I), Concept (C), and Shape (S). Artefact (A) is the centre of this study, while the other words reflect the six fundamental elements of the Artefact (Nugraha, 2012). The Rudraksha accessories, as the Artefact produced by LORI are made more contemporary and sustainable than the other brands.

These are some examples of Rudraksha accessories made by the researcher's brand LORI as shown in Figs. 11.3, 11.4, 11.5, 11.6, 11.7, and 11.8 of Table 11.1. Various accessories are made with unique and original designs. The accessories such as necklaces, brooches, bracelets, and earrings use a lot of long-lasting colours and materials.

Very few Rudraksha MSMEs in Indonesia put a special concern on accessories design, mostly making products with old design or copying it from other source. So, the LORI's designs become a fresh breeze in accessories industry. Several Rudraksha accessories in the market are shown in Figs. 11.9 and 11.10.

The ATUMICS method as shown in Fig. 11.11 is considered suitable for the objective of this research, which is to search arrangement, combination, integration, or elaboration of six fundamental elements of tradition and

**Table 11.1** Example of various Rudraksha accessories designed by LORI

|   |  |  |
|---|--|--|
|  <p><b>Fig. 11.3</b> Rudraksha accessories set consists of necklace, earrings, and bracelet. (Source Research Team, 2022)</p> |  <p><b>Fig. 11.4</b> Rudraksha bracelet with wooden beads. (Source Research Team, 2022)</p>      |  <p><b>Fig. 11.5</b> Rudraksha earrings with various beads. (Source Research Team, 2022)</p>     |
|  <p><b>Fig. 11.6</b> Rudraksha in different sizes are combined for necklace pendants. (Source Research Team, 2022)</p>       |  <p><b>Fig. 11.7</b> Rudraksha brooches with beads and stones. (Source Research Team, 2022)</p> |  <p><b>Fig. 11.8</b> Rudraksha bagcharm with beads and stones. (Source Research Team, 2023)</p> |





**Fig. 11.9** Example of Rudraksha necklaces from another brand during INACRAFT 2023. (Source Research Team, 2023)



**Fig. 11.10** Example of Rudraksha hat and bag from another brand during INACRAFT 2023. (Source Research Team, 2023)

modernity to add the accessories' function and value. The idea of ATUMICS method (Nugraha, 2012) is to combine some elements of tradition with modernity so the artefact is viewed from the micro level (technical and performance properties) and macro level (the spirit and the motivation). The micro level means the ideal arrangements of ATUMICS elements of Artefact (A), while the macro level means the spirit and the motivation of cultural, social, ecological, economic, survival, or self-expression in the creation.

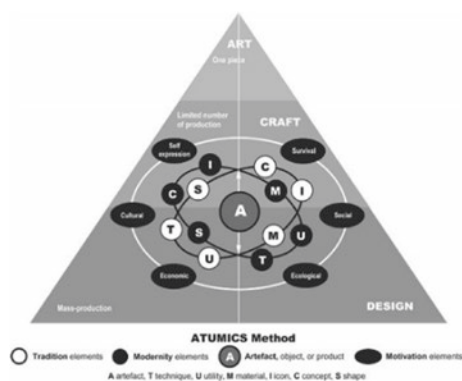
## 2 Methods

This study used a descriptive qualitative method by comparing and analysing the innovation of Rudraksha accessories from Laras Ornamen Indonesia (LORI) using the ATUMICS method of Adhi Nugraha. LORI is one of the

MSMEs from Bandung, West Java-Indonesia, specializing in making contemporary accessories from natural materials. LORI is also the researcher's project, so it can be said that this research paper is research-by-design or applied research. In addition, the researchers are conducting observations and Rudraksha jewellery workshop to farmers and collectors of Rudraksha from Pengaringan, Central Java-Indonesia during the research.

The elaboration between elements of tradition and modernity are the idea of ATUMICS method. So, the object (Artefact) in this research which is Rudraksha accessories (specifically necklace) will be viewed from the micro level and macro level that were mentioned in the introduction. The theories of sustainability, green economy, Indonesia slow fashion strategies, and others will be used to enrich the explanations of those levels.

The table template as shown in Table 11.2 will be used at the end of Results and Discussion to explain the correlation between macro level and micro level of the Rudraksha seeds necklace sustainable MSME using ATUMICS method:



**Fig. 11.11** ATUMICS Method. (Source Adhi Nugraha, 2012)

## 3 Results and Discussion

The authors conducted this research to find the sustainable process cycle of Rudraksha accessories from the beginning (farming and gathering) until the end when the final product is ready for sale. The authors observed farmers and gatherers of Rudraksha from Pengaringan, Central Java-Indonesia, the producer of Rudraksha accessories (LORI), and academics from Bandung, West Java-Indonesia. The

**Table 11.2** Macro and micro level of the Artefact table

| Macro level of the artefact | Micro level of the artefact |             |              |
|-----------------------------|-----------------------------|-------------|--------------|
| 1. Economic                 | T (Technique)               | U (Utility) | M (Material) |
|                             | I (Icon)                    | C (Concept) | S (Shape)    |
| 2. Social                   | T (Technique)               | U (Utility) | M (Material) |
|                             | I (Icon)                    | C (Concept) | S (Shape)    |
| 3. Cultural                 | T (Technique)               | U (Utility) | M (Material) |
|                             | I (Icon)                    | C (Concept) | S (Shape)    |
| 4. Ecological               | T (Technique)               | U (Utility) | M (Material) |
|                             | I (Icon)                    | C (Concept) | S (Shape)    |
| 5. Survival                 | T (Technique)               | U (Utility) | M (Material) |
|                             | I (Icon)                    | C (Concept) | S (Shape)    |
| 6. Creative self-expression | T (Technique)               | U (Utility) | M (Material) |
|                             | I (Icon)                    | C (Concept) | S (Shape)    |

authors also did a Rudraksha jewellery workshop while observing (Djakaria 2021) to know the opportunities and difficulties they faced in the creative process.

- a. The farming and gathering process to select good Rudraksha beads provides opportunities for people to get income even though they do not have the expertise to assemble and design Rudraksha accessories. In Pengaringan, Rudraksha is deliberately cultivated, while in Bandung it is mostly collected from the ones that fall from the trees. Farming and gathering Rudraksha is a lucrative business since Indonesia produces 70% of world production and mainly exports it (Ministry of Trade of the Republic of Indonesia, 2017). Rudraksha beads from Indonesia has high quality, and we can buy it in bulk because the price is low. It is no wonder since the Rudraksha beads are sold as raw material. Rudraksha fruits are shown in Fig. 11.12.
- b. The Rudraksha fruits are then processed by boiling, peeling the skin from its seeds, and drying them. The boiling process is intended to soften the skin of the Rudraksha. The boiled Rudraksha is then put in a sack and stepped on using sandals/shoes, so the skin comes off. The Rudraksha beads as shown in Fig. 11.13 then dried in the sun for three days at high sun temperatures to reduce the water inside.



**Fig. 11.12** Rudraksha beads grow on the tree. (Source Sonam Purohit, 2020)

The following process is soaking the Rudraksha beads in termite repellent. After that, the floating Rudraksha beads are discarded as it is not of good quality. Furthermore, Rudraksha is selected based on shape and size, then given a hole in the middle using a drilling machine with a hole diameter of 1–4 mm. This lengthy process is worth it because it reduces the possibility of future broken Rudraksha accessories.

- c. The colouring process of Rudraksha beads is usually by using two types of paint, namely water-based and oil-based. Water-based paint is a more environmentally friendly colouring agent than oil-based paint. LORI often picks colourful, bright, and glossy colours that are not tacky. Each paint has their plus and minus. Water-based paint is thicker, so sometimes the texture of the Rudraksha beads is too covered. Because of that, we must smear the water-based paint thinly, dried, and repeat it to ensure the Rudraksha beads' texture is still visible. On the contrary, oil-based paint doesn't cover the texture because the colour is not solid. Applying one layer of oil-based paint is enough to colour the Rudraksha beads.
- d. The following is the creative process of assembling the Rudraksha to become accessories with new designs. LORI combines Rudraksha with wood, metal, stone, glass, or other materials with various techniques as shown in Fig. 11.14, so the accessories' style is more contemporary than its counterparts. The craftsperson



**Fig. 11.13** Big Rudrakshas before colouring process. (Source Rushtook, 2018)

in many Rudraksha MSMEs needs to make more new authentic designs because it can improve Rudraksha's image from outdated accessories material to stylish sustainable material. The fashion cycle in Indonesia is usually about once every six months, so it is better to have a unique design collection in a new fashion season.

- e. The next one is the marketing process of the accessories by using various means and media, including social media. Exciting pictures and stories with a great narrative about the accessories and their process can become a great marketing tool. The sustainability aspect of Rudraksha accessories' creative process is more than enough to build a great brand image and narrative.
- f. The last process is selling the accessories at various exhibitions and places. Besides selling accessories at its showroom, LORI joins the annual INACRAFT from 2011 to 2019 (before the pandemic). It has been Indonesia's most extensive craft exhibition for over 20 years, with customers worldwide. The selling amount during each event (less than a week annually) equals 18–32% of annual selling. The sales result proves that the economic gain will follow by making innovative accessories with good quality. After the pandemic, LORI starts to join INACRAFT again in 2023.

LORI used Rudraksha seeds from Pengaringan, Central Java-Indonesia, and Bandung, West Java-Indonesia. Besides buying the raw material from the farmers and gatherers, LORI and other academics gave workshops for the people of Pengaringan, Bandung, and other places in Indonesia. The goal is to teach them to assemble and design the Rudraksha to become marketable contemporary accessories.



**Fig. 11.14** Assembling the coloured Rudraksha with other materials using pliers. (Source Research Team, 2022)

### 3.1 ATUMICS Macro Level

Based on that observation and the introduction before, these are the explanation for macro level aspects of Rudraksha accessories made by LORI and some other contemporary accessories designs:

- a. **Economic:** Based on some Rudraksha accessories MSME owners' experience, ordinary people and younger customers prefer colourful and bright colours. At the same time, natural colours are chosen by people with an art background and by people who need Rudraksha for spiritual functions. Nowadays, LORI produces more colourful and bright colours accessories because the market is more significant for economic benefit. The innovation in the accessories designs has proven to be impactful in increasing accessories selling. The income during INACRAFT, other large events or festive seasons, and export is 18–32% of LORI's annual sales, so it is very beneficial for the Rudraksha farmers and gatherers and also LORI as the MSME (owner, designer, and craftsperson).
- b. **Social:** LORI and academics are developing community services such as providing socialization and assistance to increase the Rudraksha farmers' and gatherers' ability to improve the quality of Rudraksha as the raw material for accessories (dryness, colour, size). This social service provides opportunities for the community to earn income. They also give a workshop for that community to assemble and design Rudraksha accessories.
- c. **Cultural:** Rudraksha is used as a tool for prayer and meditation. It is commonly used in India, Tibet, and Nepal and can be found in various Asian countries. It is prevalent for Hindu people because Rudraksha is believed to be the tears of Shiva after 1000 years of meditation because of compassion for humanity. It is also a fashion accessory to beautify its user.
- d. **Ecological:** Tall and shady Rudraksha trees are good for the environment. If the demand for Rudraksha accessories increases, there should be more Rudraksha trees. That condition will improve the sustainability of the accessories MSME because the materials used are natural materials that do not cause pollution to the environment. Planting Rudraksha trees can be done in certain areas so that Rudraksha seeds are more widely available and provide more shade and oxygen. Planting Rudraksha trees is also relatively easy and does not



require special care. Rudraksha grows in the highlands and lowlands. The height of the Rudraksha tree is about 20–30 m. Based on much research, Rudraksha is also great for health. Good-quality Rudraksha seeds are durable. Even though it is broken, it does not harm the environment since it uses an environmentally friendly colouring agent. So, it means less pollution than trendy accessories that use bad-quality plastic materials.

- e. Survival: Seriousness, discipline, and the ability to be creative are indeed one of the keys to success. Right now, the farmers and gatherers get enough, but it is better to improve it. At least if they can't make proper design, they can process the raw material until high quality, so it is ready for the designer to make accessories.
- f. Creative self-expression. The shape of Rudraksha seeds is beautiful after the boiling, drying, and colouring process. It has textures. Various colours, materials, and layers combined create a unique one-of-a-kind design.

The four pillars essential for sustainability are economic, social, cultural, and ecological (Nugraha, 2012), while the other two are the supporting pillars (survival and creative self-expression). Those pillars are the motivation that influences the artefact's whole conception and creative philosophy. Nowadays, the innovation produced by MSMEs should have a sustainable impact. It should be a Quintuple Helix-based innovation that not only comes from higher education related to industry and government (Triple Helix) but is also applied as a synergistic solution related to the economy, society, and environment (Pangarso et al., 2022). Afterwards, suitable exhibitions and connections will boost MSME sales.

### 3.2 ATUMICS Micro Level

Rudraksha accessories are the Artefact that will be described with six elements (Technique, Utility, Material, Icon, Colour, Shape). These explain the micro level aspect of Rudraksha accessories sustainable MSME. The examples are mainly from LORI, though several examples are from other MSMEs. We focused on one type of accessory when describing the Artefact because Rudraksha is more commonly made as a necklace, whether for aesthetic function (fashion accessories) or spiritual function (prayer beads/meditation necklace).

#### a. Technique

Various techniques as shown in Table 11.3 can make Rudraksha looks more modern than before. Even though the methods are applied more to accessories for aesthetic

function, those can also be used for the Rudraksha necklace for spiritual function.

#### b. Utility

Utility elements differences between traditional and modern are shown in Table 11.4.

#### c. Material

Material elements are shown in Table 11.5. Material variation is important for contemporary accessories.

#### d. Icon

As shown in Table 11.6, we can see several things that are considered iconic. It means that we can see the unique characteristic of the Rudraksha necklace as the Artefact.

#### e. Concept

There are several design concepts as shown in Table 11.7.

#### f. Shape





There are several shapes used in the necklace designs as shown in Table 11.8.

### 3.3 The Correlation Between the Macro and Micro Level of the Artefact Based on the ATUMICS Method





The macro and micro level of the Artefact (A) cannot be separated from each other. The correlation between the macro level and micro level as shown in Table 11.9 is the result based on the observation.

From those findings, we can see a lot of uniqueness and innovation in Rudraksha accessories that make them environmentally friendly products. The consumers should get the narrative based on those findings because it can change their purchase intentions into purchasing decisions and remove the scepticism about environmentally friendly products (Bursan et al., 2022). Innovations of environmentally friendly colouring, innovative designs, and an integrated sales system until the international level can empower the community so it can improve the society's economic condition. If everybody involved in processing Rudraksha accessories uses the green economy concept, it can increase the value, attractiveness, and acceptance level of traditional materials like Rudraksha. Picking a suitable exhibition and connection to sell Rudraksha accessories is important because the relevant exhibition and connection will boost MSME sales.

**Table 11.3** Technique element




| Picture   | Description   |
|---|---|
| <i>Traditional</i>  |   |
|  <p><b>Fig. 11.15</b> Standard Rudraksha necklace. (Source Lifestyle Kompas, 2020)</p>                                 | <p>The necklace as shown in Fig. 11.15 has one layer of beads using leather string/clear string. The string's length cannot be adjusted. There are various lengths of the necklace. If the necklace is too long, it can be worn as a bracelet or necklace with several loops</p>  |
| <i>Modern</i>   |   |
|  <p><b>Fig. 11.16</b> Standard Rudraksha necklace with adjustable string. (Source Research Team, 2022)</p>             | <p>The necklace as shown in Fig. 11.16 has one layer of beads using leather string/clear string. It becomes one loop of necklace. The difference with the traditional one is the adjustable string. It has the same characteristic as the traditional one: there are Rudraksha in all parts of the necklace loop, because every Rudraksha that is already perforated are arranged together in one string</p>  |
|  <p><b>Fig. 11.17</b> One-loop Rudraksha necklace with leather/clear string by LORI. (Source Research Team, 2022)</p> | <p>The necklace consists of two to three layers of beads using leather/clear string. As shown in Fig. 11.17, the result can be a necklace with more than one loop, or a necklace with one loop but with more complicated arrangement. As you can see in this picture, at some point the loops are united into one bead, then separated, and then united again. In some of the design, the Rudraksha is arranged sometimes only on some part of the necklace, not on all parts of it</p> |
|  <p><b>Fig. 11.18</b> One-loop Rudraksha necklace with thin wire/needle by LORI. (Source Research Team, 2022)</p>    | <p>The necklace as shown in Fig. 11.18 has one layer of beads using thin wire/needle. In another design, the necklace can use two to three layers of beads. There is a 'permanent necklace pendant' at the centre. As shown in Fig. 11.18, sometimes the beads are arranged like some kind of bouquet, and sometimes like hair braids as shown in Fig. 11.34 of Table 11.6 Icon element</p> <p>We need several specific tools if we want to make necklaces with this technique</p>      |

**Table 11.4** Utility element





| Picture  | Description  |
|--|--|
| <i>Traditional</i>   |  |
|  <p><b>Fig. 11.19</b> Standard Rudraksha necklace with Rudraksha pendant. (Source Lazada. Indonesia, n.d.)</p>      | <p>The necklace with standard design as shown in Figs. 11.19 and 11.15 of Table 11.3 Technique element is for spiritual purpose. The technique and the details are very simple. Sometimes the necklace's pendant as shown in Fig. 11.19 is decorated for aesthetic purpose. Religions that use Rudraksha necklace as prayer beads are Islam, Hindu, Buddha, and several other religions from Asia</p>  |
| <i>Modern</i>  |  |
|  <p><b>Fig. 11.20</b> Rudraksha <i>tasbih</i> with tassel. (Source Shopee Indonesia, n.d.)</p>                      | <p>Rudraksha necklace for prayer rituals still has a standard design, but with modern detail it has become more contemporary. The example is modern detail as shown in Figs. 11.20 and 11.21 such as tassel in the Moslem prayer beads (<i>tasbeih</i>) and the Om pendant in Hindu prayer beads (<i>japamala</i>). The small details make the design look modern while maintaining the basic function of Rudraksha necklace as the spiritual purpose</p> <p>Rosary for Catholics usually uses other materials such as stone. The innovation as shown in Fig. 11.22 is the rosary using Rudraksha as an authentic Asia local resource with an additional beautiful crystal cross pendant and fluted giant clams. It looks more contemporary than the other prayer beads because the technique and material arrangement is more modern. Even though the rosary has become more beautiful and fashionable, its function remains unchanged. One of the reasons why Rudraksha become the primary material is because of its health benefit</p> |
|  <p><b>Fig. 11.21</b> Rudraksha <i>japamala</i> with variation. (Source The Half Moon, n.d.)</p>                  |  |
|  <p><b>Fig. 22</b> Rudraksha rosary with a variation. Design by shambalaindo. (Source Shopee Indonesia, n.d.)</p> |  |

(continued)

**Table 11.4** (continued)

| Picture   | Description  |
|---|--|
|  <p><b>Fig. 11.23</b> Rudraksha necklace with double-function pendant by LORI. (<i>Source</i> Research Team, 2022)</p> | <p>One example of a necklace with a unique design is this double-function necklace from LORI as shown in Fig. 11.23. The necklace pendant can be used as brooch as shown in Figs. 11.24 and 11.25. So, the customer only needs to buy one accessory to enhance her/his appearance</p> <p>The pendant arrangements are various. There are several pendants that look like durian fruit, hair braids, long bouquet, and other unique shapes. The shapes are inspired by nature’s richness and ordinary things that we can find in our daily life</p> |
|  <p><b>Fig. 11.24</b> Front-bottom detail of double-function pendant by LORI. (<i>Source</i> Research Team, 2022)</p> |  |
|  <p><b>Fig. 11.25</b> Back detail of double-function pendant by LORI. (<i>Source</i> Research Team, 2022)</p>        |  |

**Table 11.5** Material element



| Picture  | Description   |
|--|---|
| <i>Traditional</i>   |   |
|  <p><b>Fig. 11.26</b> Praying necklace with Rudraksha, pearl, artificial bead, and tassel as its materials. (Source Rushtook, 2017)</p> | <p>The traditional necklace only uses Rudraksha beads of the same size. If the necklace uses mixed materials, it usually uses various materials in the same shape, though the size of each material may vary as shown in Fig. 11.26</p> <p>A bigger Rudraksha beads size is usually made as the necklace pendant for aesthetic purposes as shown in Fig. 11.19 of Table 11.4 Utility element. In prayer beads, it functions as the necklace's divider that helps its user to count during praying/meditation as shown in Fig. 11.20 of Table 11.4 Utility element</p>   |
| <i>Modern</i>  |   |
|  <p><b>Fig. 11.27</b> Rudraksha, wood, and snail house. (Source Research Team, 2022)</p>   | <p>There are a lot of sustainable materials that already exist from the old days. The necklaces in Figs. 11.27, 11.29 and 1.30 are the examples of Rudraksha combined with other sustainable materials (snail house, wood, stone, freshwater pearl, and tassel from real leather). Nowadays we appreciate natural resources more because we realize that we should manage our natural resources to make a better environment condition. Besides, Rudraksha has an interesting texture and has great durability and strength if it is dry enough with a good manual drying process. It also has unique aesthetical values compared with synthetic and fabricated materials</p> |
|  <p><b>Fig. 11.28</b> Rudraksha and wood. (Source Research Team, 2022)</p>  |   |
|  <p><b>Fig. 11.29</b> Rudraksha and stone. (Source Research Team, 2022)</p>   |   |

(continued)

**Table 11.5** (continued)



|   |  |
|---|--|
|  <p><b>Fig. 11.30</b> Rudraksha, fresh-water pearl, and tassel (<i>Source</i> Research Team, 2022)</p> |  |
|---|--|

**Table 11.6** Icon element



| Picture   | Description   |
|---|---|
| <p><i>Traditional</i></p>  <p><b>Fig. 11.31</b> Rudraksha with natural colour (<i>Source</i> Research Team, 2022)</p> | <p>As shown in Fig. 11.31, Natural colours are applied to Rudraksha prayer beads. The real colour of Rudraksha is exposed. The colour is iconic for prayer beads because it symbolizes the purity of spirituality. That kind of colour is also applied to some traditional and modern Rudraksha necklaces. Nowadays the demand for a natural colour Rudraksha necklace is lower than the colourful ones</p>   |
| <p><i>Modern</i></p>  <p><b>Fig. 11.32</b> Colourful Rudraksha by LORI. (<i>Source</i> Research Team, 2022)</p>      | <p>As shown in Fig. 11.32, colourful Rudraksha necklace is one of many iconic thing of LORI accessories. To get the iconic colourful Rudraksha, the craftsperson paint Rudraksha with an environmentally friendly colouring agent. They use final coating to make the colour toned down. A high-quality and sustainable topcoat is very important to make the Rudraksha looks brighter and more glossy but still elegant. The finishing improves the attractiveness of the necklaces. At the same time, it increased the durability of the material</p> |

(continued)

**Table 11.6** (continued)




| Picture  | Description   |
|--|---|
|  <p><b>Fig. 11.33</b> The necklace pendant arrangement shaped like durian fruit by LORI. (Source Research Team, 2022)</p>  <p><b>Fig. 11.34</b> The necklace pendant arrangement with the shape of hair braids (Source Research Team, 2022)</p> | <p>Several iconic designs from LORI are inspired by nature and daily life, such as the necklace inspired by durian fruit as shown in Fig. 11.33 and hair braids as shown in Fig. 11.34. Each design is authentic, and LORI never makes the same design twice even though some have similarity. Besides the shape, the iconic thing from LORI is the material combination (mixed materials). We can see in many LORI necklaces that the materials are varied</p> |

**Table 11.7** Concept element

| Picture  | Description   |
|--|---|
| <i>Traditional</i>   |   |
| As shown in Fig. 11.15 of Table 11.3 Technique element, Fig. 11.19 of Table 11.4 Utility element, and Fig. 11.26 of Table 11.5 Material element                                    | The traditional Rudraksha necklace concept is mostly function/utility (prayer beads, fashion accessories) with health benefits. That's why the design is a simple one-loop necklace<br>Some traditional Rudraksha necklaces have additional spiritual concepts because the quantity of mukhi ('faces' separated by a line or cleft) along the Rudraksha beads has various meanings and spiritual benefits   |
| <i>Modern</i>  |   |
|  <p><b>Fig. 11.35</b> The contemporary necklace pendant by LORI. (Source Research Team, 2022)</p> | <p>The necklaces concepts are mostly aesthetic. Every design has a unique aesthetical value, such as the one that looks like durian fruit as shown in Fig. 11.33 and hair braids as shown in Fig. 11.34 (Table 11.6 Icon element), triangle as shown in Fig. 11.36, and complex arrangement in one-loop necklace as shown in Fig. 11.38 of Table 11.8 Shape element. Even the simple one as shown in Fig. 11.35 is also aesthetic because of its material variation</p> |
|  <p><b>Fig. 11.36</b> The triangle arrangement by LORI. (Source Research Team, 2022)</p>         |   |






**Table 11.8** Shape element

| Picture  | Description  |
|--|--|
| <i>Traditional</i>   |  |
|  <p><b>Fig. 11.37</b> One-loop necklace by LORI. (Source Research Team, 2022)</p>   | <p>Simple one-loop necklace with medium-length as shown in Fig. 11.37 is the most basic shape for traditional and modern necklace until now. There is also a longer one as shown in Fig. 11.16 of Table 11.3 Technique element, so people can use it as a necklace with two or more loops</p>  |
| <i>Modern</i>  |  |
|  <p><b>Fig. 11.38</b> One-loop necklace with additional beads arrangement in centre part by LORI. (Source Research Team, 2022)</p> | <p>The examples are necklaces with various layers:</p> <ul style="list-style-type: none"> <li>● One-loop medium-length necklace with additional beads sequence in some part of its centre as shown in Fig. 11.38. The sequence is made with a specific technique</li> <li>● One-loop medium-length necklace with two to three layers necklace. The simple arrangement is Fig. 11.39 while the complex one is Fig. 11.40 (using a specific technique)</li> </ul> <p>Besides its loop and layer, the shape of LORI necklaces is various because of its material combination. Different materials have different size, shape, texture, and colour</p> |
|  <p><b>Fig. 11.39</b> One-loop necklace with two layers of simple arrangements by LORI. (Source Research Team, 2022)</p>          |  |

(continued)

**Table 11.8** (continued)

| Picture  | Description   |
|--|---|
|  <p><b>Fig. 11.40</b> One-loop necklace with two layers of complex arrangements by LORI. (Source Research Team, 2022)</p> | <p>Other innovative shapes:</p> <ul style="list-style-type: none"> <li>● One-loop medium-length necklace with additional beads sequence in durian fruit shape as shown in Fig. 11.33 of Table 11.6 Icon element</li> <li>● One-loop medium-length necklace with additional beads sequence in long strings that looks like hair braids as shown in Fig. 11.34 of Table 11.6 Icon element</li> <li>● One-loop medium-length necklace with additional beads sequence in triangle shape as shown in Fig. 11.36 of Table 11.7 Concept element</li> <li>● One-loop necklace with additional long beads sequence on Fig. 11.41. It is similar but has a very different shape than Fig. 11.34 because of the material. The long beads sequence here uses a small necklace chain at the upper part, while Fig. 11.34 uses beads from various materials that are combined using clear string</li> <li>● One-loop short-length necklace with additional beads sequence in circle (choker) on Fig. 11.42</li> </ul> |
|  <p><b>Fig. 11.41</b> One-loop necklace with additional long beads sequence by LORI. (Source Research Team, 2022)</p>    |   |
|  <p><b>Fig. 11.42</b> Choker by LORI. (Source Research Team, 2022)</p>  |   |

**Table 11.9** Correlation between macro level and micro level of the Artefact

| Macro level of the artefact  |  | Micro level of the artefact   |   |  |  |
|--|--|---|---|--|--|
|  |  | <b>T (Technique)</b>  | <b>U (Utility)</b>  | <b>M (Material)</b>  |  |
| <b>1. Economic</b><br>Improvement in marketability and price               |  | Various unique techniques make a unique shape. It will make the necklace more marketable  | Necklace as fashion accessory and prayer beads for various religions  | MSME buy Rudraksha by bulk and there is no specific requirement about Rudraksha's mukhi amount if the size, dryness, and the durability are good. Using mixed materials for design innovation is improving its marketability |  |
|  |  | <b>I (Icon)</b><br>Colourful but elegant with glossy and matte finishing using environmentally friendly colouring agent   | <b>C (Concept)</b><br>There are several artistic concepts and stories behind the process that are loved by the customers. The customers can choose the necklace according to their preferences                            | <b>S (Shape)</b><br>Various unique shapes and arrangements make the necklace more marketable. Such as the necklace with durian fruit and hair braids look-alike arrangements   |  |
|  | <b>2. Social</b><br>Hardskill and softskill improvement of farmers, gatherers, and MSME (owner, designer, craftperson) | <b>T (Technique)</b><br>Empowering the society by giving workshop about preparing good-quality materials and make necklace for the Rudraksha farmers, gatherers, and MSME | <b>U (Utility)</b><br>Empowering the society by giving workshop about how to make creative function innovation of necklace as fashion accessory and prayer beads  | <b>M (Material)</b><br>Empowering the society by giving them insight about the uniqueness and quality of Rudraksha and local materials in their location. It boosts local pride and local wisdom                             |  |
| <b>3. Cultural</b><br>Rudraksha accessories for anyone from any background |  | <b>I (Icon)</b><br>Empowering the society by giving them insight about the uniqueness and quality of Rudraksha so they have pride on their local Rudraksha product        | <b>C (Concept)</b><br>Empowering the society by giving them workshop about making artistic concept and telling the story behind the process that enrich the value of the necklace and the society that support its making | <b>S (Shape)</b><br>Empowering the society by giving them workshop so they can experiment making necklace to become various shapes   |  |
|  |  | <b>T (Technique)</b><br>Various traditional and modern techniques can be mixed to make design innovation  | <b>U (Utility)</b><br>Necklace as fashion accessory for anyone. Necklace as prayer beads for various religions, not only to the religion who first used it as prayer beads (Hindu)  | <b>M (Material)</b><br>Any good-quality natural materials from any region can be mixed with Rudraksha to improve its design  |  |
|  |  | <b>I (Icon)</b><br>Icon not only for Asia (India, Indonesia, etc.) but for global citizen who loves and aware about sustainability  | <b>C (Concept)</b><br>The accessories are accepted by local and international market (global) because the primary concept is its functionality and health benefit   | <b>S (Shape)</b><br>Various cultural experience and everyday things can be an inspiration for the necklace's shape   |  |

(continued)

Table 11.9 (continued)

| Macro level of the artefact   | Micro level of the artefact  |  |   |  |
|---|--|--|---|--|
|   | <b>T (Technique)</b>   | <b>U (Utility)</b>   | <b>M (Material)</b>   |  |
| 4. <b>Ecological</b><br>Low negative impact to the environment              | The farming, gathering, finishing raw materials, designing, making, and selling the accessories using techniques that are environmentally friendly   | The necklace can be used according to its function and some of the designs have multiple functions so people are not too consumptive   | Rudraksha and other natural local materials with environmentally friendly colouring agent for finishing. The materials have durability and strength so the accessories last longer                                |  |
|   | <b>I (Icon)</b><br>Icon for sustainability because Rudraksha has many benefits for the people and nature if we process and make it as accessories properly   | <b>C (Concept)</b><br>Environmentally friendly concept for the process, the accessories, and its packaging. It can make the customers remember to take care mother earth   | <b>S (Shape)</b><br>Mimicry of nature that can remind people about the nature's richness and our daily life (durian fruit, hair braids, etc.)   |  |
|   | <b>T (Technique)</b><br>Surviving any traditional and modern technique that has a good quality. Consistency in using the technique   | <b>U (Utility)</b><br>Surviving the main function: necklace as fashion accessory and prayer beads for various religions. Add more function (brooch, bracelet, earrings, etc.) to make Rudraksha survive longer in the MSME | <b>M (Material)</b><br>Mixing materials to make the accessories more unique and has many different variations. Variations makes people do not feel bored with the accessories design and eager to buy more        |  |
| 5. <b>Survival</b><br>Everlasting quality                                   | <b>I (Icon)</b><br>Proof that traditional material that seems ordinary can survive the times and become great if we process it our best effort   | <b>C (Concept)</b><br>Nature's beauty and Rudraksha's health benefits are the concept source that can survive time because they have lasting quality   | <b>S (Shape)</b><br>Mimicry of nature is never out of date. The shape that inspired by nature's richness and our daily life are always interesting  |  |
|   | <b>T (Technique)</b><br>Application of various techniques in one necklace is not prohibited because there would be a lot of design innovations when we are experimenting with different techniques                             | <b>U (Utility)</b><br>Creatively experimenting with necklace as fashion accessory and prayer beads for various religions without losing its main function  | <b>M (Material)</b><br>Mixing materials to make the accessories more unique and has many different variations. There are not many Rudraksha accessories MSME beside LORI who experimenting with various materials |  |
|   | <b>I (Icon)</b><br>Each necklace (custom or ready stock) is one of a kind even though using the same materials/colours/technique. There are no two or more accessories that have the same design even though they look similar | <b>C (Concept)</b><br>Usually inspired by nature's beauty, daily life, and artistic/intuitive drive  | <b>S (Shape)</b><br>Emphasizing nature's beauty, daily life, and artistic elements to become a unique accessories shape   |  |
| 6. <b>Creative self-expression</b><br>Innovation in design and its elements |  |  |   |  |
|   |  |  |   |  |

## 4 Conclusions

We must mix modern, traditional, local, and global elements to make Rudraksha accessories more appealing to customers and marketable. Rudraksha, which used to be considered too conventional and outdated, can have a new image by several MSMEs that consistently make good-quality Rudraksha accessories, such as LORI.

By looking at the various designs of the LORI necklace, we can see that the improvement of the Artefact in each element at the micro level (Technique, Utility, Material, Icon, Concept, and Shape) are making an impact on the macro level (Economic, Social, Cultural, Ecological, Survival, Creative self-expression). On the other hand, the spirit and motivation on the macro level inspire people to do something innovative on the micro level. The effort to make Rudraksha stakeholders elevate their skill and knowledge in making innovative Rudraksha accessories using ATUMICS method will make the Rudraksha accessories more sustainable.

Design innovation results determine the sustainability of Rudraksha accessories and its MSME. With innovation in making accessories (collecting, selecting, drying, colouring, finishing, designing, arranging, selling), there would be a sustainable MSME. The innovation will improve the crucial four pillars of sustainability, which are economic, social, cultural, and ecological. Quintuple Helix-based innovation should be the basis of MSMEs innovation. By doing that, the biggest producer of Rudraksha as raw material, such as Indonesia, can become the biggest producer of contemporary Rudraksha accessories.

In future research, in-depth observation about the Rudraksha accessories MSME Quintuple Helix-based innovation and its MSME owner, designer, and craftsperson after the pandemic is needed so we can learn how to make the accessories business survive and flourish in various conditions.

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