

# Sustainable Practices in Assam's Bell and Brass Metal Handicrafts: A SWOT-TOWS and Triple Bottom Line Analysis

Dr. Lipi Bhuyan

Assistant Professor, University of Science and Technology Meghalaya

## Abstract

The Bell and Brass metal handicrafts of Assam represent a centuries-old legacy of cultural heritage, craftsmanship, and sustainable livelihoods. This study evaluates the long-term sustainability of these traditional industries by examining economic, social, and environmental dimensions. The research employed a mixed-methods approach, which included quantitative surveys of 332 artisans from Sarthebari and Hajo, as well as qualitative focus group discussions. These methods were used to assess livelihood patterns, market challenges, and perceptions of sustainability. Findings mention that bell and brass metal units provide rural employment and keep the culture intact. This handicraft industry faces significant challenges, including a shortage of raw materials, exploitation by middlemen, low mechanization, and limited involvement from younger generations. The SWOT-TOWS analysis was done to identify the key strategies. The study highlights that diversifying into decorative crafts can boost artisans' income while eco-friendly production methods maintain environmental balance. Using the Triple Bottom Line framework, it emphasizes the need to balance economic viability, social inclusivity, and ecological responsibility. To achieve sustainable growth, it is crucial to preserve traditional techniques, introduce design innovations, improve working conditions, and train younger artisans.

**Keywords:** Sustainability, Bell Metal, Brass Metal, Assam, SWOT-TOWS, Triple Bottom Line, Handicraft, GI Tag, Cultural Heritage

## 1. Introduction:

The United Nations Sustainable Development Goals (UNSDGs) serve as a roadmap for building holistic and sustainable settlements globally and are recognized and followed by major countries. However, UNSDG mentions Cultural heritage with its tangible and intangible components can function as both drivers and enablers for attaining the SDG when culture-based solutions can guarantee the realization of processes aimed at reaching the SDG (Sridharan et al., 2023).<sup>1</sup> Sustainability in handicraft product is a global phenomenon (Harkonen et al., 2019).<sup>2</sup>

Traditionally, in every society of the world, handicrafts have remained a primary activity. Crafts grew from functional items to decorative and elegant pieces because man attempted to beautify his surroundings. Some pieces became works of art and held unique, purposeful, and ritualistic

Published: 24 March 2026

DOI: <https://doi.org/10.70558/SPIJSH.2026.v3.i3.45601>

Copyright © 2026 The Author(s). This work is licensed under a Creative Commons Attribution 4.0 International License (CC BY 4.0).

places, while some creativities ensured a high standard of luxuriance in everyday life (Chattopadhyay, 1984, cited in Chutia, 2017).<sup>3</sup> Moreover, the nation's rich heritage of culture uses traditional crafting skills in various fields, including jewellery, leather goods, metalware, textile printing and weaving, marble and stone crafts, and textile weaving (Jadhav M. S. 2014).<sup>4</sup>

Assamese metal craft can be seen in the crafts made of Brass and Bell metal. Metal objects are part and parcel of every household's domestic, religious product, functional products, utilitarian product, decorative products, and traditional/conventional products. The importance of it is so immense that people continue to opt to eat from classic metal dishes and plates even in the age of steel and ceramic items. The health benefits associated with metals exceed their antiquated appearance and are favoured over modern dining sets. In Assam, Bell and Brass metal objects are considered valuable by people of the region and are only considered next to gold or silver items (Chutia, 2017).<sup>5</sup>

Offering appealing *kah*(Bell) goods as gifts has always been a fundamental social tradition. Brides still carry traditional bell-shaped metal objects to their in-laws' houses as part of social custom (ibid). Equal importance is given to Brass metal products in Assamese society and culture. Brass is an alloy created by combining 70% copper and 30% zinc. It is extremely valuable and used as decorative, religious, and traditional items. Looking into the importance of Bell and Brass Metal craft present study is done (Deka,2012).<sup>6</sup>

SWOT analysis helps in know the internal and external strength weakness threat and opportunity of SME product and tows matrix helps us formulating strategies considering (SO, WO, ST, WT), how to build on strengths to exploit opportunities; or how to shore up weaknesses to face threats ( Marlena et al. 2017; Maulina et al. 2018; Izni et al. 2020).<sup>7</sup>

## 2. Literature review:

A. Sustainability and handicraft: Traditional craft can be explained from their association with the local, their relationship with themselves and with the ecology (Bardhan, A., & Bhattacharya, A. 2022)<sup>8</sup>. Sustainable craft and craft practices are intentionally designed to challenge the prevalence of products that lack reusability, thereby opposing the notion of "throw-away" consumerism. These craft products are developed with sustainability as a fundamental principle, often referred to as "sustainable designs." Sustainable crafts are distinguished by their innovative conceptualizations and practices, which reflect unique design elements while promoting ecological responsibility. They function as a catalyst for transforming society toward a more sustainable future (Vaananen, N., & Pollanen, S, 2020).<sup>9</sup>

B. Culture preservation: A study by Trcek, D. (2022)<sup>10</sup> proposes a novel blockchain-based framework for cultural heritage preservation, emphasizing the integration of disruptive digital technologies with the tourism sector. Zhang, Y., & He, D. (2023)<sup>11</sup>also mentioned that AI empowers the inheritance and innovation of traditional handicrafts by creating unified digital resource databases, enabling VR/AR-based immersive displays, applying 3D laser scanning and modelling, and shifting from technology-driven to human experience-oriented design—thus addressing issues of brain drain, low digitization, and declining cultural transmission while ensuring long-term sustainable preservation and promotion.

C. Role of Triple bottom line (economic, social, environmental) of handicraft sustainability: The Triple Bottom Line (TBL) framework offers a holistic approach to sustainability in handicrafts by integrating economic, social, and environmental considerations. For handicraft industries, this implies ensuring that artisans achieve economic viability, promoting fair labor practices, preserving cultural heritage, and utilizing environmentally responsible materials and processes. Together, these elements contribute to a truly sustainable craft industry.<sup>12</sup>Elkington argued that the TBL serves as a catalyst for moving beyond traditional paradigms toward a more pluralistic world. This shift requires different types of corporations to receive tailored responses from governments and civil society. This concept is often referred to as sustainable entrepreneurship (SE).<sup>13</sup>

Assamese Bell & Brass crafts: Several studies have examined the Bell and Brass metal industries in India, particularly in Assam. Kalita (2007)<sup>14</sup> and Goswami (2009)<sup>15</sup> reported the declining condition of the Sarthebari Bell metal industry due to lack of raw materials, credit issues, and competition from machine-made goods. Patowary (2010)<sup>16</sup> highlighted artisans' past exploitation and the role of cooperatives, while Shah (2011)<sup>17</sup> noted poor marketing, low income, and youth disinterest. Chutia (2017)<sup>18</sup> studied commercialization and found decorative crafts more profitable. Barman (2017)<sup>19</sup> compared Assam and West Bengal, emphasizing material scarcity and exploitation. Kuriakose (2018)<sup>20</sup> discussed the fading Bell metal craft of Kerala due to declining youth participation.

### 3. Research Methodology

Research Design: This study includes a mixed-methods research design using both quantitative and qualitative approaches to investigate the sustainability of bell and brass metal handicrafts in Assam. Quantitative surveys provided measurable insights into demographics, income patterns, product diversification, and financial resilience. At the same time, qualitative focus group discussions (FGDs) captured in-depth perspectives from artisans regarding sustainability, heritage preservation, and emerging challenges (Hills,2001).<sup>21</sup> The integration of both methods facilitated methodological triangulation, ensuring that the findings were robust and comprehensive.

Study Area and Duration: The research was conducted in Sarthebari (Barpeta district) and Hajo (Kamrup district), the two primary clusters known for traditional bell and brass metal crafts in Assam. These areas are historically recognized for their concentration of skilled artisans and heritage production systems. Data collection was done a six-month period, from June to April 2025.

Study Population and Sampling: The target population consisted of active artisans directly involved in the production of bell and brass metal crafts. Practicing artisans with five or more years of experience in production. The sample size included a total of 332 artisans (182 from Sarthebari and 150 from Hajo). Additionally, four focus groups were organized (two with bell metal artisans and two with brass artisans), each consisting of 6–8 participants, to explore qualitative aspects of the study. (Neuma,2000)<sup>22</sup>

**Sampling Technique:** A quota sampling strategy ensured proportional representation of both bell and brass metal artisans from the two clusters, while snowball sampling facilitated access to less visible artisan groups through community networks.

**Data Collection Methods: Quantitative Data:** A structured survey was administered in Assamese covering demographic details, craft type, product mix, income, savings, market access, and willingness to adopt promotional activities. The survey tool was pre-tested on 20 artisans for clarity and validity, with necessary refinements made afterward. Cronbach's alpha score of 0.82 was established for the study.

**Qualitative Data:** Focus groups were guided by a semi-structured approach to capture artisans' narratives on sustainability, intergenerational skill transfer, market competition, raw material scarcity, and policy expectations. All discussions were audio-recorded with prior consent and transcribed verbatim.

**Qualitative Dimensions:** Artisans' perspectives on cultural heritage, ecological practices, challenges of mechanization, and future sustainability.

**Data Analysis: Quantitative Analysis:** Data were coded and analyzed using SPSS v26 and MS Excel. Descriptive statistics (mean, standard deviation, percentages) were computed, while inferential statistics included Chi-square tests of association, supplemented by Cramer's V to determine the strength of associations between categorical variables (e.g., product mix and income, savings pattern and craft type). Statistical significance was set at  $p < 0.05$ .

**Qualitative Analysis:** Transcripts from FGDs were subjected to thematic analysis. Codes were developed inductively and clustered into themes such as cultural continuity, economic constraints, market adaptation, and health/environmental sustainability (Gupta, 2021).<sup>23</sup> Findings were cross-mapped with the SWOT-TOWS framework to derive context-specific sustainability strategies.

#### **4. Theoretical Framework:**

The bell and brass metal industry significantly contributes to the economic development of rural areas in Assam, particularly in regions such as Sarthebari and Hajo. This industry is essential for providing livelihoods for numerous families, generating employment opportunities, and serving as a critical supplementary occupation within an agrarian economy. Sustainability is defined by the World Commission on Environment and Development in the Brundtland Report as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This definition emphasizes the importance of balancing current economic activities with the preservation of resources for future generations (WCED, 1987).<sup>25</sup>

The handicraft sector supports sustainability by focusing on the Triple Bottom Line (TBL): ensuring economic viability for artisans, preserving socio-cultural heritage, and encouraging environmentally responsible production practices (Bogale & Tiruneh, 2022).<sup>26</sup> In assessing the sustainability of rural small-scale industries, such as the Bell and Brass metal craft of Assam—a traditional form of metalworking with deep cultural roots—we can effectively use

Elkington's three pillars as a framework. These pillars provide a comprehensive approach for evaluating and understanding the long-term viability of this craft.<sup>27</sup>

**Economic viability:** Bell and Brass metal units provides income to hundreds of people. It is a livelihood income for maximum of artisans of Sarthebari and Hajo. Products like traditional utensils, decorative items and ritualistic has a great potential in the market but other machine-made products are giving tough competition to the traditional handicraft industry. This industry not only has a economic contribution but also a cultural and traditional heritage of Assam, India. G.I has also been provided to the Bell metal products of Assam.

**Social** Bell and Brass metal industry is a cultural heritage and age-old industry which has been passed down from ages to ages. A group of people work together to craft a line of products the skills which they have inherited from generation to generation. It's a unified business of a community as a whole.

**Environmental sustainability:** The industry largely uses recyclable metals (bell metal, brass, bronze), minimizing was. Small-scale manual production consumes less energy compared to industrial manufacturing. Sourcing raw materials sometimes leads to over-dependence on imports or unsustainable. Promoting circular economy practices (metal reuse, recycling), and shifting to cleaner furnaces can ensure environmental resilience.

Considering these factors a SWOT analysis/TOWS matrix has been proposed to derive to a appropriate strategy in Table 1 and Table 2.

Table 1: SWOT Analysis

Internal Factors (Within Control)	External Factors (Outside Control)
<p><b>Strengths(S):</b> Heritage culture (sustainable tradition) GI tag for Bell metal Handmade by skilled artisans Eco-friendly &amp; sustainable production Low-cost labour Employment generation</p>	<p><b>Opportunities(O):</b> Govt. support &amp; GI recognition Global demand for handmade/eco-friendly crafts Cultural tourism promotion E-commerce &amp; digital platforms Export potential to niche luxury markets</p>
<p><b>Weakness(W):</b> Raw material allocation issues Lack of modern machinery Youth disinterest Reluctance to adopt technology Lack of training/infrastructure</p>	<p><b>Threats(T):</b> Competition from Muradabad &amp; machine-made duplicates Rising raw material costs Exploitation by middlemen Globalization &amp; synthetic alternatives Seasonal/unpredictable demand Changing consumer preferences</p>

Source: Authors Compilation

Table 2: TOWS MARKET MATRIX

	Opportunities	Threat
Strength	<b>(Strength-Opportunities) Strategies</b> <ul style="list-style-type: none"> <li>• Use GI tag + heritage culture to position as sustainable craft in export markets.</li> <li>• Blend traditional handmade skills with modern decorative trends.</li> <li>• Promote eco-friendly &amp; low-carbon production for environmentally conscious buyers.</li> </ul>	<b>(Strength-Threat) Strategies</b> <ul style="list-style-type: none"> <li>• Use GI tag &amp; authenticity to protect against Muradabad duplicates.</li> <li>• Leverage low-cost labour &amp; handmade uniqueness to compete with machine-made goods.</li> <li>• Build artisan cooperatives to minimize middlemen exploitation.</li> </ul>
Weakness	<b>Weakness-Opportunities Strategies</b> <ul style="list-style-type: none"> <li>• Improve raw material access via govt. schemes &amp; cooperatives.</li> <li>• Introduce semi-mechanized tools while marketing handmade exclusivity.</li> <li>• Attract youth through design training &amp; sustainable entrepreneurship programs.</li> <li>• Link artisans to e-commerce &amp; global platforms.</li> </ul>	<b>Weakness-Threat Strategies</b> <ul style="list-style-type: none"> <li>• Form cooperatives to negotiate raw material costs.</li> <li>• Diversify products (decorative + utility) to reduce seasonal demand risks.</li> <li>• Upgrade infrastructure &amp; working conditions to meet global competition.</li> <li>• Provide continuous training to artisans to resist globalization pressures.</li> </ul>

Source: Author's Compilation

## 5. Results and Discussion

**Demographic Profile:** Most artisans were male, with the majority aged 26–40 years. Education levels were low, with 10–28% reporting no formal schooling. Families were primarily nuclear, and artisans belonged mainly to general and OBC categories.

**Craft Genre and Income:** Chi-square analysis revealed a significant relationship between craft genre and income. Decorative/non-conventional products yielded higher incomes than conventional items. Cramer's V values of 0.836 (brass) and 0.688 (bell) confirmed strong associations.

**Savings Pattern:** Savings patterns varied by craft type. Conventional artisans reported limited or no savings, while decorative or mixed artisans demonstrated higher annual savings, with some exceeding ₹50,000. Diversification correlated with stronger financial resilience.

**Willingness to Invest in Promotion:** Income level influenced artisans' willingness to spend on promotion. Over 74% of bell artisans and 47% of brass artisans expressed interest, particularly

those earning above ₹12,000 monthly. Cramer's V values (0.845 for bell, 0.887 for brass) indicated strong associations.

Product Mix and Income: Diversified product ranges corresponded with significantly higher incomes. For both crafts, artisans producing five or more items earned over ₹21,000 monthly. Chi-square results confirmed a strong positive association.

## 6. Findings from Focus Group Discussions:

### Artisans' Perspectives on Sustainability of Bell and Brass Metal Products.

Bell Metal Artisans (Sarthebari): During the Focus group discussion it was found that Production is entirely handmade; artisans resist mechanization to preserve heritage and eco-friendliness. The traditional products, such as lotta, are witnessing a decline attributable to diminished demand and the erosion of specialized skills. The reliance on intermediaries for both sales and raw materials is resulting in decreased profit margins for artisans. Although younger artisans are exploring social media marketing to enhance visibility, profitability remains constrained. Furthermore, the scarcity of raw materials and the escalating costs of charcoal pose significant challenges to economic sustainability. Competition from replicas produced in Moradabad further undermines the authenticity of these traditional crafts. The anticipated implementation of Geographical Indication (GI) protection in 2024 is regarded as a valuable mechanism for the preservation of cultural heritage. Additionally, artisans have reported various health issues stemming from prolonged hammering and exposure to elevated temperatures, prompting a call for government assistance.

Brass Metal Artisans (Hajo): Traditionally produce utilitarian products, but youth have diversified into decorative and furniture items (lamps, chairs, tables). Products marketed through local shops, door-to-door sales, and online platforms. Brass is cheaper and easier to mould, making it more adaptable. Constraints include raw material shortages, middlemen exploitation, and lack of training on government-provided machinery. Artisans call for customer education and government-supported marketing agencies to highlight the eco-friendly heritage of Brass crafts. During observation by the researcher, it was also found that the Mahajan who are also the head artisans manipulates and dominates the other artisans.

Table 3: Mapping of FDG Findings with TOWS matrix and sustainability dimension

FDG Findings	TOWS matrix strategy	Sustainability
1. Artisans prefers making Handmade production preferred over machine made products	Strength(S)	Environmental: Eco-friendly, low carbon footprint.
2. Crafting decorative product with a blend of Traditional motifs and design.	Strength and opportunities(S-W)	Social: Heritage preservation, generational preservation of skill

		Economic: Potentiality to have a quality niche handicraft market
Decline in traditional <i>lotta</i> production due to low demand.  Interference and exploitation of middleman (Mahaajan) in terms of providing raw material	Weakness (W)	Social: Loss of intangible heritage; Economic: Reduced market diversity, unfair pricing, low profit
Limited marketing knowledge but it was found that the young artisans are exploring social media marketing.  2.Scarcity of raw materials; mahajan monopoly; reliance on scrap meta	Weakness and opportunities(W-O)	Economic: Potential for digital platforms;  Social: Youth engagement  Economic: Higher costs; Environmental: Recycling of scrap as partial mitigation
Competition from duplicate machine made product. Rise in metal price and fuel price(charcoal)	Threat	Economic – market displacement; Social :devaluation of local craft
GI protection for Bell Metal (2024).  Promotion of Bell/Brass alongside Silk & Assam tourism suggested	Opportunities	Economic: Proper Branding with proper pricing  Social: Cultural identity and visibility.  Environmental: encourages Cultural Tourism

Source: Author's compilation

## 7. Conclusion:

The Bell and Brass metal handicrafts of Assam represent more than just utilitarian products; they embody centuries-old cultural heritage, traditional knowledge, and community-based craftsmanship. This study emphasizes that while the sector continues to sustain livelihoods and preserve heritage, it faces significant challenges. These include raw material scarcity, exploitation by middlemen, declining participation from youth, and competition from machine-made products. A SWOT-TOWS analysis shows that the long-term sustainability of this

industry depends on strategies that integrate economic viability, social inclusion, and environmental responsibility. Strengthening the Geographical Indication (GI) tag, building artisan cooperatives, expanding access to government schemes, and leveraging digital platforms and e-commerce can help artisans achieve fairer incomes and greater market visibility. Additionally, preserving traditional techniques while promoting innovation in product diversification will be crucial for balancing cultural heritage with contemporary market demands. From an environmental perspective, the craft already contributes positively through recycling and low-energy manual production methods. However, investments in cleaner furnaces and improved working conditions are necessary for sustainable growth. On the social front, training programs, intergenerational knowledge transfer, and artisan welfare schemes can encourage younger generations to continue this tradition. The Bell and Brass metal crafts of Assam have significant potential to evolve into a global model of sustainable handicrafts, aligning with the United Nations Sustainable Development Goals (UNSDGs) and Elkington's Triple Bottom Line. With targeted interventions, the sector can not only safeguard cultural heritage but also ensure inclusive growth and environmental resilience for future generations.

### **Acknowledgements**

This work is based on the research that has been done by the researcher during her research tenure based on primary and secondary sources of data.

### **Conflict of interests**

The authors declare that no competing interests exist.

### **Funding information**

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

### **REFERENCES:**

- Bardhan, A., & Bhattacharya, A. (2022). Role of traditional crafts in sustainable development and building community resilience: Case stories from India. *Science. Culture. Society. Economy. Politics*, 2(1), 38–50. <https://doi.org/10.2478/csep-2022-0004>
- Barman, S. (2017). *A comparative study of bell metal works in Assam and West Bengal* (Doctoral dissertation, Gauhati University). <http://hdl.handle.net/10603/215235>
- Bogale, & Tiruneh. (2022). Sustainability refers to a holistic framework integrating economic growth, social inclusion, and environmental protection guided by the 17 Sustainable Development Goals (SDGs).
- Chutia, L. J. (2017). *Crafts of Assam and its commercialization: A study with special reference to artefacts and artisans* (Doctoral dissertation, Tezpur University). [http://agnee.tezu.ernet.in:8082/jspui/bitstream/1994/1260/7/07\\_content.pdf](http://agnee.tezu.ernet.in:8082/jspui/bitstream/1994/1260/7/07_content.pdf)
- Chutia, L. J., & Sarma, M. K. (2017). Native tradition and changing market dynamics: The future sustainability of Hajo and Sarthebari metal crafts. *Chitrolekha Journal on Art and Design*, 1(2). <https://doi.org/10.21659/cjad.12.v1n201>

- Crafting sustainability: Handcraft in contemporary art and cultural sustainability in the Finnish Lapland. (2018). *Sustainability*, 10(6), 1907. <https://doi.org/10.3390/su10061907>
- Cultural heritage preservation by using blockchain technologies. (2021). *Heritage Science*, 10(1), 1–12. <https://doi.org/10.1186/s40494-021-00643-9>
- Deka, A. (2012). *Bell and brass metal industries in Assam: Present status and prospects for development in the changing market environment* (Doctoral dissertation, Gauhati University).
- Elkington, J. (2004). Enter the triple bottom line. In A. Henriques & J. Richardson (Eds.), *The triple bottom line: Does it all add up?* (pp. 1–16). Earthscan.
- Goswami, M. (2017). *Silk and bell metal industry in colonial and postcolonial Assam* (Doctoral dissertation, Gauhati University). <http://hdl.handle.net/10603/223181>
- Gupta, S. P., & Gupta, M. P. (2021). *Business research methods*. Sultan Chand & Sons.
- Hill, J., & Wright, L. T. (2001). A qualitative research agenda for small to medium-sized enterprises. *Marketing Intelligence & Planning*, 19(6), 432–443.
- International Journal of Physical and Social Sciences. (2017). Bell metal industry of Assam in the contemporary market environment: A viability assessment. *International Journal of Physical and Social Sciences*, 7(3), 32–40. <http://www.ijmra.us>
- Jadhav, S. (2013). Indian handicrafts: Growing or depleting. *IOSR Journal of Business and Management*, 15(2), 7–13.
- Kalita, B. (2007). *A geographical analysis of bell-metal industry in Sarthebari, Assam* (Doctoral dissertation, North-Eastern Hill University). <http://hdl.handle.net/10603/60700>
- Kuriakose, B. (2018, March 19). Preserving the bell metal craft of Mannar.
- Maulina, E., & Raharja, S. J. (2018). SWOT analysis for business strategies: A case of Virage Awi in the bamboo craft industries, Bandung, Indonesia. *Review of Integrative Business and Economics Research*, 7(2), 213–225.
- Marlena, N., Dwijayanti, R., & Prakoso, A. F. (2017). SWOT analysis to develop market share in SMEs of hand-made fashion. In *Proceedings of the 2nd International Conference on Economic Education and Entrepreneurship (ICEEE 2017)* (pp. 274–278). SCITEPRESS. <https://doi.org/10.5220/0006884602740278>
- Neuman, W. L. (2000). *Social research methods: Qualitative and quantitative approaches* (4th ed.). Allyn & Bacon.
- Patowary, M. M. (Ed.). (2010). *Barkanh*. Mritunjaya Offset Press.
- Shah, R. (2011). *Brass metal craft: A need assessment survey, Barpeta, Assam*.

- Sridharan, K., Sharma, A., & Ji, S. (2023). Cultural heritage conservation through the framework of UNSDG. In *Proceedings of the International Conference on Research into Design* (pp. 1129–1145). Springer Nature.
- United Nations. (2015). *Transforming our world: The 2030 agenda for sustainable development*. United Nations.
- Väänänen, N., & Pöllänen, S. (2020). Conceptualizing sustainable craft: Concept analysis of literature. *The Design Journal*, 23(3), 337–355. <https://doi.org/10.1080/14606925.2020.171827>
- World Commission on Environment and Development. (1987). *Our common future*. Oxford University Press.
- Zhang, Y., & He, D. (2023). Inheritance and innovation of traditional handicraft skills based on artificial intelligence. *Transactions on Computer Science and Intelligent Systems Research*, 2, 163–169. <https://doi.org/10.62051/rc69jc38>