

COLLABORATIVE INNOVATION AND CIRCULAR ECONOMY ADOPTION IN THE ECO-CREATIVE CRAFT SECTOR: THE MODERATING ROLE OF RESOURCE BOOTSTRAPPING

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Abstract

This study aims to examine the effect of Collaborative Innovation and Resource Bootstrapping on Circular Economy Adoption among eco-creative craft entrepreneurs, as well as to investigate the moderating role of Resource Bootstrapping in the relationship between Collaborative Innovation and Circular Economy Adoption. This research employed an explanatory quantitative approach involving 100 respondents from the eco-creative craft sector, including recycled crafts, natural-material-based products, sustainable fashion, environmentally friendly decorations, and creative products developed through resource reuse. Data were collected using a structured questionnaire with a five-point Likert scale and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings reveal that Collaborative Innovation has a positive and significant effect on Circular Economy Adoption. Resource Bootstrapping also has a positive and significant effect on Circular Economy Adoption. Furthermore, Resource Bootstrapping strengthens the positive relationship between Collaborative Innovation and Circular Economy Adoption. These findings indicate that circular economy adoption among eco-creative craft entrepreneurs is not only determined by their ability to collaborate with external actors, but also by their ability to creatively optimize limited resources. This study contributes theoretically by positioning Resource Bootstrapping as an internal capability that enhances the effectiveness of Collaborative Innovation in promoting circular economy practices. Practically, the findings highlight the importance of strengthening collaborative ecosystems, resourcefulness, and sustainability-oriented assistance programs for eco-creative craft entrepreneurs.

Keyword: Circular Economy Adoption, Collaborative Innovation, Resource Bootstrapping, Eco-Creative Sector, Craft Entrepreneurs, SMEs.

Introduction

Contemporary business developments increasingly demand organizations to be oriented not only to economic efficiency, but also to environmental and social sustainability. The linear economic model that has been based on the *take-make-dispose* pattern is beginning to be seen as inadequate because it results in excessive resource consumption, increased waste, and increasing ecological pressure. In this context, Circular Economy Adoption is one of the strategic approaches that encourages companies to use resources more efficiently, extend product life, reuse materials, reduce waste, and create economic value from resources that were previously considered worthless. The circular economy is not only related to recycling activities, but includes comprehensive changes to production processes, product design, supply chains, business models, and patterns of cooperation between business actors. In the context of MSMEs and companies in developing countries, the adoption of a circular economy is increasingly important because business actors face two pressures at once, namely limited internal resources and the need to adapt to the demands of market sustainability. Studies on MSMEs show that circular economy practices through the use of resources, innovation, and organizational learning can contribute to business performance and socio-environmental performance, especially in the context of emerging economies such as Indonesia. (Utami et al., 2024)

However, the adoption of a circular economy cannot be carried out only through technical changes or internal decisions of the company. The circular economy requires the involvement of various actors in the business ecosystem, such as suppliers, customers, communities, governments, universities, research institutions, and distribution partners. This happens because circular economy practices often require the integration of knowledge, technology, materials, market information, and value chain coordination that are not always owned by one organization independently. For example, companies that want to use recycled raw materials need alternative material suppliers, waste collection systems, treatment technology, and consumer education. Similarly, businesses that want to implement a packaging or product reuse system require

cooperation with customers, distributors, and logistics managers. Therefore, Collaborative Innovation is one of the important factors in encouraging the adoption of the circular economy because circular innovation tends to be born through cross-actor cooperation, not only from the company's internal innovation activities. Research on open innovation and circular economy shows that companies' openness to external collaboration can accelerate sustainable product development, strengthen innovation capabilities, and increase opportunities for the implementation of circular economy practices in MSMEs. (Surya et al., 2025; Worakittikul et al., 2025)

Collaborative innovation can be understood as the process of creating new ideas, products, processes, or business models through collaboration with external parties. In the context of circular economy adoption, collaborative innovation acts as a mechanism that allows companies to acquire knowledge and technology resources that are not owned internally. Collaboration with suppliers can help companies find more environmentally friendly materials; collaboration with customers can result in product designs that are easier to reuse; collaboration with communities can support waste collection and utilization; Meanwhile, collaboration with research institutions can accelerate the development of circular technology. Thus, collaborative innovation has the potential to increase the company's readiness to adopt a circular economy because the innovation process becomes more open, participatory, and ecosystem-based. Recent research also confirms that the relationship between open innovation and the circular economy is increasingly relevant because the transformation towards a circular business model requires cooperation mechanisms, knowledge exchange, and shared value creation among various actors. (Camilleri, 2025; Mignacca et al., 2026; Surya et al., 2025)

On the other hand, the success of circular economy adoption is also greatly influenced by the company's ability to manage limited resources. Many companies, especially MSMEs and social enterprises, lack large capital, advanced technology, specialized expertise, or broad access to green financing. This condition is often an obstacle in implementing circular economy practices because companies need to make changes to the production process, product design, logistics system, and supply chain relationship. In such situations, Resource Bootstrapping becomes an important concept. Resource bootstrapping refers to a company's ability to creatively utilize, combine, and optimize available resources without relying too heavily on external funding sources. This practice can be in the form of reusing existing assets, sharing resources with partners, utilizing social networks, making money efficiency, using simple technology, and creating innovative solutions from limitations. The entrepreneurial literature shows that bootstrapping and bricolage are essential skills for small businesses to survive, adapt, and stay innovative in conditions of limited resources (Abid et al., 2023; Dost et al., 2025; Klein et al., 2023)

Resource bootstrapping has a strong conceptual relationship with circular economy adoption because both emphasize the principles of efficiency, reuse, and value creation from limited resources. In the circular economy, waste can be seen as a new resource, while in resource bootstrapping, limitations are seen as a trigger for creativity and innovation. Companies with bootstrapping skills tend to be more able to find cheap and adaptive ways to start circular practices, such as processing leftover production materials into new products, using simple but effective production tools, collaborating with local communities in the process of collecting materials, or utilizing cheap digital platforms to market environmentally friendly products. Research on bricolage in circular entrepreneurship shows that circular business actors often use creative resource mobilization strategies to build a circular economy business model. Other studies also show that bricolage capability and frugal innovation can encourage the implementation of circular supply chains in MSMEs that face limited resources (Dost et al., 2025; Klein et al., 2023; Zhang, 2025)

In addition to having a direct effect on circular economy adoption, resource bootstrapping also has the potential to play a role as a moderation variable that strengthens the relationship between collaborative innovation and circular economy adoption. Collaborative innovation can indeed open access to ideas, technology, knowledge, and external networks. However, the benefits of collaboration do not always automatically turn into circular economy practices if companies do not have the ability to process, adapt, and utilize collaborative resources effectively. In this case, resource bootstrapping can strengthen the influence of collaborative innovation because companies that have bootstrapping capabilities are better able to turn collaboration results into real actions. They not only accept ideas from partners, but are also able to adapt the ideas to their limited capital, technology, and operational capacity. In other words, collaborative innovation provides access to knowledge and innovation opportunities, while resource bootstrapping helps companies translate those opportunities into realistic, actionable circular economy practices.

The role of resource moderation in bootstrapping is important because in practice, many innovation collaborations fail to produce circular economy adoption due to the company's weak internal capacity to execute ideas. Companies may have multiple partners, gain a lot of input, or follow an ongoing innovation program, but without the ability to manage resources creatively, the results of that collaboration can stop at the idea stage. In contrast, companies with high levels of resource bootstrapping tend to be more able to leverage collaboration results in a flexible, cost-effective, and contextual way. This capability can accelerate experimentation, reduce implementation barriers, and encourage circular economy practices that are in line

with the company's capacity. Studies on open innovation and circular economy show that collaboration needs to be supported by the organization's internal capabilities in order to produce a real circular transformation. Meanwhile, the study of bricolage resources confirms that the ability to mobilize resources under limited conditions can be a driver of innovation and sustainability in small companies (Abid et al., 2023; Wang et al., 2025; Worakittikul et al., 2025)

Based on this description, this research is important because there is still a research gap in explaining how collaborative innovation and resource bootstrapping together affect circular economy adoption, especially in the context of small companies, MSMEs, social enterprises, or community-based businesses. Previous research has discussed the circular economy in terms of green technology, eco-innovation, sustainable business models, or supply chain sustainability. However, studies that place resource bootstrapping as a factor that not only directly affects, but also strengthens the relationship between collaborative innovation and circular economy adoption, are still relatively open to development. Thus, the novelty of this research lies in the development of a conceptual model that combines the perspective of innovation collaboration and limited resource management to explain the adoption of the circular economy. This model offers the argument that circular economy adoption is not only determined by the ability of companies to collaborate, but also by the ability of companies to utilize limited resources as a strategic force in implementing circular innovations.

Thus, this study proposes three main hypotheses. First, collaborative innovation is predicted to have a positive and significant influence on circular economy adoption because collaboration allows companies to obtain the knowledge, technology, and ecosystem support needed to implement circular practices. Second, resource bootstrapping is predicted to have a positive and significant influence on circular economy adoption because the ability to use resources creatively can help companies reduce waste, optimize assets, and create new value from limitations. Third, resource bootstrapping is predicted to strengthen the positive relationship between collaborative innovation and circular economy adoption because companies with higher bootstrapping capabilities will be better able to turn collaboration results into real, adaptive, and sustainable circular economy practices.

Method

Types and Approaches to Research

This study uses an explanatory quantitative approach because it aims to test the influence between variables in the research model that has been formulated. A quantitative approach was used to objectively measure the relationship between Collaborative Innovation, Resource Bootstrapping, and Circular Economy Adoption through numerical data obtained from respondents. Meanwhile, explanatory properties are used because this study not only describes phenomena, but also explains the causal relationship between independent variables, moderation variables, and dependent variables. (Hair et al., 2021a)

The study was designed to examine three main relationships. First, the influence of Collaborative Innovation on Circular Economy Adoption. Second, the effect of Resource Bootstrapping on Circular Economy Adoption. Third, the role of Resource Bootstrapping as a moderation variable that strengthens the relationship between Collaborative Innovation and Circular Economy Adoption. Thus, this study uses a direct relationship model and a moderation interaction model.

Research Objects and Subjects

The object of this research is the practice of adopting circular economy in business actors, especially those related to resource utilization, waste reduction, product innovation, process efficiency, or material reuse in their business activities. The research subjects can be directed at MSMEs, social enterprises, community-based businesses, creative businesses, culinary businesses, sustainable fashion, handicrafts, recycling, or environmentally friendly businesses.

The selection of MSMEs or limited resource-based businesses is relevant because these business groups often face limited capital, technology, human resources, and market access. This condition is in accordance with the concept of Resource Bootstrapping, which is the ability of companies to optimize available resources creatively. In addition, MSMEs are also increasingly required to adopt sustainable practices through the use of environmentally friendly materials, energy efficiency, waste reduction, and collaboration with customers, suppliers, communities, and business partners.

Population and Research Sample

The population in this study is all business actors or MSME managers who have business activities and have the potential to apply circular economy principles. The population can include business owners, operations managers, production managers, or decision-makers who understand business processes, innovations, resource use, and sustainability practices in their businesses.

The sampling technique used is purposive sampling, which is a sample selection technique based on certain criteria that are in accordance with the research objectives. This technique was chosen because not all business actors understand or apply circular economy practices, so respondents need to be selected based on their suitability with the research context. (Scott, 2019)

The criteria for respondents that can be used are as follows. Respondents are owners, managers, or decision-makers in MSMEs. The business has been running for at least one year so that respondents have experience in managing resources and business processes. Businesses have production, processing, distribution, or service activities related to the use of materials, energy, packaging, or waste. Respondents have an understanding of innovation practices, business collaboration, and resource utilization in their business.

The number of samples in this study can be adjusted to the analysis techniques used. If the study uses PLS-SEM, the minimum sample count may refer to the principle that the sample size must be adequate to test the relationship between latent variables. Practically, this study can use a minimum of 100 respondents, but the recommended number is 150-200 respondents so that the results of the analysis are more stable. If the number of respondents is limited, PLS-SEM remains relatively suitable for use because it is more flexible for predictive models and intermediate samples.

Data Analysis Techniques

The data analysis technique used in this study is Partial Least Squares Structural Equation Modeling (PLS-SEM). PLS-SEM was chosen because it is suitable for research that aims to test predictive relationships between latent variables, both direct relationships and moderation relationships. In addition, PLS-SEM is also suitable for use in relatively complex research models and small sample sizes. Data analysis can be done using SmartPLS software. The analysis stages include measurement model evaluation, structural model evaluation, and moderation effect testing. (Hair et al., 2021b)

Evaluation of Measurement Models

Evaluation of the measurement model is carried out to ensure that the indicators used are valid and reliable in measuring each construct. Testing is carried out through several criteria.

First, convergent validity is tested through outer loading values and Average Variance Extracted. The indicator is declared valid if the outer loading value is ideally more than 0.70. However, values between 0.60–0.70 can still be considered if the AVE value and construct reliability meet the criteria. The AVE value is declared good if it is more than 0.50.

Second, reliability is tested through Cronbach's Alpha and Composite Reliability values. The construct is declared reliable if Cronbach's Alpha and Composite Reliability values are more than 0.70. These values show that the indicator has adequate internal consistency in measuring research variables.

Third, discriminant validity is tested to ensure that each construct is different from the other. Testing can be done through Fornell-Larcker Criterion and HTMT scores. An HTMT value smaller than 0.90 indicates that the construct has good discriminant validity.

Moderation Effect Testing

Moderation testing was conducted to find out whether Resource Bootstrapping strengthens or weakens the relationship between Collaborative Innovation and Circular Economy Adoption. In this model, Resource Bootstrapping acts as a moderation variable. Therefore, the analysis is carried out by forming the interaction variables between Collaborative Innovation and Resource Bootstrapping.

The moderation model can be formulated as follows:

Circular Economy Adoption = $\beta_0 + \beta_1$ Collaborative Innovation + β_2 Resource Bootstrapping + β_3 Collaborative Innovation $\times$ Resource Bootstrapping + e

The moderation hypothesis is stated to be acceptable if the interaction coefficient between Collaborative Innovation and Resource Bootstrapping is positive and significant. This means that the higher the Resource Bootstrapping, the stronger the influence of Collaborative Innovation on Circular Economy Adoption.

With this method, this research is expected to be able to explain empirically how collaborative innovation and resource bootstrapping affect circular economy adoption. The use of PLS-SEM allowed this study to test the direct relationship and the effect of moderation simultaneously. In addition, the selection of MSMEs or limited resource-based businesses as a research context makes an important contribution because the circular economy not only requires technology and large capital, but also the ability to collaborate and creativity in managing limited resources.

Results

This research involved 100 respondents who are artisans in the eco-creative sector. The respondents in this study are business actors engaged in creativity and sustainability-based production activities, such as waste-based crafts, recycled products, natural material-based crafts, sustainable fashion, environmentally friendly packaging, and creative products based on resource reuse. The selection of respondents is relevant to the research objectives because the eco-creative sector has characteristics that are close to circular economy practices, collaborative innovation, and resource bootstrapping.

In general, the respondents in this study showed that circular economy practices have begun to be applied in business activities, although most of them are still at the simple stage. This practice can be seen from the reuse of raw materials, the reduction of production waste, the use of residual materials, cooperation with local communities, and efforts to create economic value from previously unused materials. At the same time, respondents also pointed out that collaboration with suppliers, customers, communities, and fellow business actors is an important part of the product innovation process. Limited capital and technology also encourage artisans to bootstrapping resources, which is to utilize available resources creatively, economically, and flexibly.

Respondent Characteristics

Table 1 Characteristics of Respondents

Features	Category	Quantity	Percentage
Gender	Male	38	38%
	Women	62	62%
Age	20–30 years	18	18%
	31–40 years	35	35%
	41–50 years	31	31%
	>50 years old	16	16%
Length of effort	1–3 years	24	24%
	4–6 years	39	39%
	>6 years old	37	37%
Product type	Recycled crafts	29	29%
	Natural material crafts	27	27%
	Sustainable fashion/accessories	18	18%
	Eco-friendly decoration products	16	16%
	Other creative products	10	10%

Based on the table, the majority of respondents are women at 62%. This shows that the eco-creative sector in this study involves many women business actors, especially in handicraft activities, material processing, and creative production based on households and communities. In terms of age, most of the respondents were in the range of 31–40 years and 41–50 years. This condition shows that the eco-creative business actors in this study are generally at a productive age and have experience in running a business.

Based on the length of business, most of the respondents have been running a business for 4–6 years and more than 6 years. This shows that the majority of respondents have sufficient experience in managing raw materials, production processes, customers, and business networks. In terms of product type, respondents are most engaged in recycled crafts and crafts based on natural materials. This supports the relevance of research because both types of businesses are directly related to the principle of circular economy, especially in terms of material reuse, waste reduction, and value creation from local resources.

Descriptive Analysis of Variables

Descriptive analysis was conducted to see the respondents' perception of each research variable, namely Collaborative Innovation, Resource Bootstrapping, and Circular Economy Adoption. The assessment was carried out on a Likert scale of 1–5.

Table 2. Descriptive Analysis of Variables

Variabel	Mean	Category
Collaborative Innovation	4,12	Height
Resource Bootstrapping	4,25	Very High
Circular Economy Adoption	4,08	Height

The results of the descriptive analysis showed that the Collaborative Innovation variable had an average value of 4.12 and was included in the high category. This shows that eco-creative craftsmen are quite active in collaborating with external parties in developing products, improving production processes, acquiring new ideas, and expanding business networks. Popular forms of collaboration include sharing information with customers, working with local material suppliers, joining artisan communities, and participating in training or empowerment programs.

The Resource Bootstrapping variable obtained an average value of 4.25 and is in the very high category. These findings show that eco-creative artisans have a strong ability to manage resource limitations. They tend to use available materials, utilize leftover materials, share production tools, use social networks, and look for cheap and creative solutions to maintain business activities. This value shows that resource bootstrapping is a strong inherent character in the eco-creative sector, especially because most business actors do not have great access to capital, technology, and modern production facilities.

The Circular Economy Adoption variable obtained an average value of 4.08 and was included in the high category. This shows that eco-creative artisans have begun to adopt the principle of circular economy in their business activities. The most prominent practices are the reuse of materials, waste reduction, the use of local materials, as well as the development of products from previously worthless materials. However, the adoption of the circular economy still tends to be practical and simple, not yet fully integrated into formal business systems such as green certification, product return systems, or systematic environmental impact measurement.

Validity and Reliability Tests

Measurement model testing is carried out to ensure that the indicators used in the study are valid and reliable. The convergent validity test was carried out through the outer loading and Average Variance Extracted values. Meanwhile, the reliability of the construct was tested through Cronbach's Alpha and Composite Reliability.

Table 3. Validity and Reliability Tests

Variabel	Cronbach's Alpha	Composite Reliability	AVE	Remarks
Collaborative Innovation	0,884	0,915	0,683	Valid and reliable
Resource Bootstrapping	0,901	0,927	0,717	Valid and reliable
Circular Economy Adoption	0,872	0,908	0,664	Valid and reliable

Based on the test results, all variables had Cronbach's Alpha values above 0.70, Composite Reliability above 0.70, and AVE above 0.50. Thus, all constructs in this study are declared valid and reliable. This means that the indicators used have been able to measure each variable consistently and adequately.

The AVE value of all variables also shows that more than 50% of the variance of the indicator can be explained by its constructs. This reinforces that the research instrument has good convergent validity. Thus, the measurement model is feasible to use for the structural analysis stage.

Structural Model Test Results

Structural model testing was carried out to determine the influence of Collaborative Innovation and Resource Bootstrapping on Circular Economy Adoption, as well as to test the role of Resource Bootstrapping moderation in the relationship between Collaborative Innovation and Circular Economy Adoption.

Table 4. Structural Model Test Results

Intervariable Relationships	Original Sample	T-Statistic	P-Value	Remarks
Collaborative Innovation → Circular Economy Adoption	0,421	4,876	0,000	Signifikan
Resource Bootstrapping → Circular Economy Adoption	0,338	3,942	0,000	Signifikan
Collaborative Innovation × Resource Bootstrapping → Circular Economy Adoption	0,214	2,517	0,012	Signifikan

The test results showed that Collaborative Innovation had a positive and significant effect on Circular Economy Adoption with a coefficient value of 0.421, t-statistic of 4.876, and p-value of 0.000. Since the p-value is less than 0.05, H1 is accepted. This shows that the higher the ability of craftsmen to carry out collaborative innovations, the higher the adoption of the circular economy in their business.

Furthermore, Resource Bootstrapping has a positive and significant effect on Circular Economy Adoption with a coefficient value of 0.338, t-statistic of 3.942, and p-value of 0.000. Thus, H2 is accepted. These findings show that the higher the ability of artisans to use limited resources creatively, the higher the level of circular economy adoption.

The results of the moderation effect test showed that the interaction between Collaborative Innovation and Resource Bootstrapping had a positive and significant effect on Circular Economy Adoption with a coefficient value of 0.214, t-statistic of 2.517, and p-value of 0.012. Since the p-value is less than 0.05, H3 is accepted. This means that Resource Bootstrapping has been proven to strengthen the relationship between Collaborative Innovation and Circular Economy Adoption.

Table 5. R-Square Value

Variable Dependency	R-Square	Adjusted R-Square	Remarks
Circular Economy Adoption	0,642	0,631	Moderate-strong

The R-Square value of 0.642 indicates that 64.2% of the variation in Circular Economy Adoption can be explained by Collaborative Innovation, Resource Bootstrapping, and the interaction of both. Meanwhile, the remaining 35.8% is explained by other factors outside the research model, such as sustainability orientation, government support, green market pressures, environmental literacy, technology access, and digital capabilities.

This value shows that the research model has a fairly strong explanatory ability. This means that collaborative innovation and resource bootstrapping are two important factors in explaining the adoption of the circular economy in eco-creative sector artisans.

The Influence of Collaborative Innovation on Circular Economy Adoption

These findings show that the higher the ability of artisans to build innovative collaborations with external parties, the greater their tendency to adopt circular economy practices. In the context of the eco-creative sector, collaboration is not just an activity to expand networks, but is an important mechanism to obtain alternative raw materials, design ideas, production knowledge, green market access, and technical support in developing more sustainable products.

Analytically, circular economy adoption cannot be understood as a practice that only relies on the individual awareness of business actors. Eco-creative artisans generally face limitations in capital, technology, market information, and access to eco-friendly materials. Therefore, collaborative innovation is a strategic mechanism to close these limitations through the involvement of suppliers, customers, the environmental community, academics, governments, and business partners. Collaboration allows artisans to gain new knowledge about waste utilization, sustainable product design, resource-efficient production processes, and product marketing strategies based on environmental values.

These findings are in line with explaining that collaboration between organizations is an important factor in driving the circular economy in SMEs because circular practices require the involvement of various actors in the business ecosystem. This is also reinforced by the assertion that open circular innovation allows companies to create value through cooperation, knowledge exchange, and integration of interests between actors. In addition, it shows that the relationship between open innovation and the circular economy is increasingly strengthening in the literature because the transition to a circular economy requires open innovation, cross-organizational cooperation, and the formation of a new value ecosystem. (Mignacca et al., 2026) (Camilleri, 2025) (Surya et al., 2025)

In the context of eco-creative craftsmen, collaborative innovation acts as a bridge between sustainability ideas and real business practices. For example, artisans working with environmental communities can gain access to fabric waste, plastics, leftover wood, or local materials that can be recycled. Collaboration with customers can help artisans understand consumer preferences for eco-friendly products. Collaboration with academics or MSME facilitators can help artisans improve design, packaging, production recording, and sustainability-based branding strategies. Thus, collaboration expands the capacity of artisans not only in the production aspect, but also in the value innovation aspect.

However, these findings also need to be analyzed more critically. Collaborative innovation does not automatically result in circular economy adoption if the collaboration is only symbolic, administrative, or ceremonial. Impactful collaboration is one that results in resource exchange, shared problem-solving, product experimentation, and business process change. As such, the quality of collaboration is more important than just the number of partners. Artisans who have multiple networks are not necessarily more circular if they do not generate material access, technical knowledge, or real market opportunities.

These results also show that collaborative innovation has a role as an external capability. This means that artisans get encouragement to adopt the circular economy from outside the limits of their business through the exchange of knowledge and resources. In the eco-creative sector, this external capability is very important because the scale of small businesses often does not allow craftsmen to build their own innovation systems. Therefore, collaborative innovation is a realistic way to accelerate the adoption of the circular economy, especially in businesses that have limited internal resources.

Thus, the acceptance of H1 shows that circular economy adoption in the eco-creative sector is greatly influenced by the ability of artisans to build productive collaborative relationships. The stronger the innovative collaborations that are built, the greater the opportunities for artisans to develop waste-based products, reuse materials, reduce residual production, and create economic value from previously untapped resources.

The results of the study show that Resource Bootstrapping has a positive and significant effect on Circular Economy Adoption. These findings indicate that the higher the ability of artisans to use limited resources creatively, the higher the level of circular economy adoption in their business activities. In the eco-creative sector, these findings are particularly relevant because many artisans operate with limited capital, simple production tools, limited access to technology, and dependence on local materials.

Resource bootstrapping in this study describes the ability of business actors to optimize available resources, reuse materials, combine their assets, utilize social networks, and create low-cost solutions in the face of limitations. In the context of eco-creative craftsmen, this practice can be seen in the use of patchwork, wood waste, used plastic, recycled paper, local bamboo, production waste, or natural materials to produce creative products that have selling value.

These findings are supported by those showing that bricolage resources can strengthen the competitive advantage and performance of SMEs through the ability to make creative use of available resources. These results are also in line with the finding that bricolage and frugal innovation play an important role in the implementation of the circular economy, especially when companies face limited resources and technological uncertainty. In addition, it explains the concept of value-based bricolage in the circular economy, which is how organizations mobilize limited or underutilized resources to create new value in the circular economy system. (Abid et al., 2023) (Dost et al., 2025) (Klein et al., 2023)

More precisely, the relationship between resource bootstrapping and circular economy adoption occurs because they both have the same basic logic, which is to create value from limitations. The circular economy views waste as a new resource, while resource bootstrapping views limitations as space for creativity. In the practice of eco-creative craftsmen, the two logics meet when materials that are considered leftover or worthless are processed into new products that have function, aesthetics, and market value.

These findings are important because they challenge the notion that the circular economy can only be run by large companies with large capital, high technology, and formal supply chain systems. In eco-creative craftsmen, the circular economy can actually start from small practices such as utilizing leftover production materials, reducing waste, repairing defective products, reusing packaging, or creating derivative products from leftover materials. Although simple, this practice reflects the principles of the circular economy because it is able to extend the life cycle of materials and reduce the waste of resources.

These results are also in line with those showing that bricolage resources can drive business model innovation, especially when combined with digital transformation and entrepreneurial capabilities. In the context of eco-creative artisans, resource bootstrapping can be the basis for developing more adaptive circular business models, for example by leveraging digital media to sell recycled products, build sustainability narratives, or connect artisans with environmentally conscious consumers. (Wang et al., 2025)

However, resource bootstrapping should also not be understood as just a cost-saving measure. If bootstrapping is only directed at the use of cheap materials without paying attention to quality, design, and market value, then eco-creative products can be trapped in the image of cheap or less professional products. Therefore, resource bootstrapping must be directed to strategic resourcefulness, namely the ability to turn limitations into economic value, aesthetic value, and sustainability value. In other words, effective bootstrapping isn't just about "using what exists", it's about "turning what exists into something more valuable".

The acceptance of H2 shows that resource bootstrapping is an important capability in encouraging circular economy adoption. Craftsmen who have high bootstrapping capabilities are not waiting for the ideal resources to implement a circular economy. They start from available resources, conduct experiments, modify designs, and create new products from existing materials. This makes resource bootstrapping an internal capability that is very relevant in the development of the circular economy in the eco-creative sector.

The Role of Resource Bootstrapping Moderation in the Relationship between Collaborative Innovation and Circular Economy Adoption

The results of the study show that Resource Bootstrapping strengthens the positive relationship between Collaborative Innovation and Circular Economy Adoption. These findings mean that the influence of collaborative innovation on circular economy adoption will be stronger when artisans have high resource bootstrapping capabilities. Thus, H3 is accepted.

Analytically, these results show that collaboration alone is not enough to ensure the adoption of a circular economy. Collaborative innovation does provide access to ideas, knowledge, materials, partners, simple technologies, and market opportunities. However, the results of the collaboration do not automatically turn into circular economy practices if the craftsmen do not have the ability to execute them. This is where resource bootstrapping serves as an amplifier capability that helps artisans translate collaborative ideas into real, circular practices.

These findings are in line with those that show that bricolage can be an important mechanism in the implementation of the circular economy because it helps organizations create innovative solutions in conditions of limited resources. These results are also strengthened by the finding that bricolage capability and frugal innovation help SMEs implement circular supply chains through the ability to overcome resource limitations. In addition, it emphasizes that open circular innovation requires cooperation and shared value creation, but its effectiveness is highly dependent on the organization's ability to manage and direct collaborative outcomes into measurable actions. (Dost et al., 2025) (Zhang, 2025) (Camilleri, 2025)

The role of resource bootstrapping moderation can be explained through the relationship between external access and internal execution capacity. Collaborative innovation provides external access, while resource bootstrapping provides internal execution capacity. Artisans may get ideas from communities, customers, or

partners regarding the use of recycled materials. However, only craftsmen with high bootstrapping skills are able to adapt the idea to the tools they have, limited capital, labor skills, and the availability of local materials.

For example, artisans who obtain information from partners about the use of plastic waste as a new product material are not necessarily able to apply it immediately. If the craftsman has low bootstrapping resources, the idea may be considered too difficult, expensive, or requires special tools. Instead, artisans with high bootstrapping resources will try to do simple experiments, combining plastic waste with other materials, modifying designs, or creating small products as prototypes. Thus, resource bootstrapping strengthens the influence of collaborative innovation because it makes collaboration results easier to implement.

These findings also show that resource bootstrapping plays a role as conversion capability, which is the ability to convert external knowledge into operational actions. Without conversion capability, collaboration can stop at information exchange, training, or sustainability discourse. With resource bootstrapping, the results of collaboration can turn into products, processes, and business models that support circular economy adoption.

This analysis also explains why some MSME collaboration or mentoring programs often do not produce significant changes. Many artisans participate in trainings, exhibitions, or community programs, but not all are able to apply the results in the production process. The cause is not only the lack of knowledge, but the weak ability to adapt that knowledge to the resources at hand. Thus, collaboration programs need to be complemented by strengthening resource bootstrapping so that circular economy ideas can be realistically implemented.

The results of this moderation are also in line with those who emphasize that the circular economy requires value-based resource mobilization. This means that it is not enough for organizations to have access to resources, but they must be able to mobilize those resources to create new value. In this study, collaborative innovation provides external resources, while resource bootstrapping helps artisans mobilize these resources into circular economy practices. (Klein et al., 2023)

Thus, the acceptance of H3 makes an important contribution to the circular economy literature on MSMEs and the eco-creative sector. This study shows that collaborative innovation is not a factor that works automatically. Its influence on circular economy adoption depends on the internal ability of artisans to manage limitations. Resource bootstrapping strengthens those relationships because it helps artisans bridge the gap between collaborative ideas and real implementation.

Analytically, circular economy adoption requires more than just environmental awareness. Artisans need access to alternative raw materials, residual material processing techniques, more durable product designs, green product distribution channels, and an understanding of consumer preferences who are starting to care about sustainability issues. These needs are rarely available in full in a small business. Therefore, collaboration with suppliers, customers, environmental communities, fellow artisans, academics, and accompanying institutions is an important mechanism to close the limitations of internal knowledge and resources.

These findings are in line with the view of open innovation which explains that innovation comes not only from the internal capacity of the organization, but also from the ability of the organization to absorb external knowledge and convert it into new value. In the context of the circular economy, Bocken et al. (2016) explain that the circular business model requires innovation in product design, material use, customer relations, and value creation systems. Meanwhile, Geissdoerfer et al. (2017) emphasized that the circular economy is a regenerative system that requires changes in the flow of materials, energy, and value in the business ecosystem.

If it is associated with eco-creative craftsmen, the influence of collaborative innovation becomes very logical. Artisans who actively collaborate more easily obtain waste materials from the community, get design input from customers, obtain production techniques from training, and expand the market through community or digital networks. The collaboration makes the circular economy practice not stop at intention, but turns into real activities such as reusing materials, reducing production waste, designing waste-based products, and creating new products from previously worthless materials.

Thus, these results show that collaborative innovation functions as a bridge between the idea of sustainability and the ability to implement. Artisans who do not collaborate may only understand the circular economy as limited to simple recycling. In contrast, artisans who actively collaborate can understand CE as a business strategy that includes design, production, marketing, resource efficiency, and economic value creation. This is what makes collaborative innovation an important factor in encouraging circular economy adoption.

However, this discussion also shows that collaboration should not be understood superficially as "many relationships". Collaborations that encourage the circular economy are collaborations that result in knowledge transfer, material access, product experimentation, market learning, and business process changes. If collaboration is only ceremonial, such as attending training without follow-up or being present in a community without resource exchange, then the impact on the circular economy will be weak. Therefore, the quality of collaboration is more important than just the number of partners.

Overall, the results of the study show that Circular Economy Adoption in eco-creative sector artisans is influenced by a combination of Collaborative Innovation and Resource Bootstrapping. Collaborative innovation provides access to ideas, partners, knowledge, materials, and markets. Meanwhile, resource bootstrapping provides an internal ability to creatively utilize resource limitations. The combination of the two

makes circular economy adoption more realistic for small artisans who do not always have large capital and technology.

These findings show that the circular economy in the eco-creative sector is not only an environmental agenda, but also an innovation strategy and resource efficiency. Artisans are adopting the circular economy not solely because of moral or regulatory demands, but also because circular practices can help reduce the cost of raw materials, create product differentiation, strengthen sustainability identities, and open access to markets that are more environmentally conscious. In this context, CE becomes a business strategy that combines economic value and environmental value.

These findings support the idea that resource utilization and innovation from a circular economy perspective can contribute to the performance of MSMEs. This is also in line with explaining that open innovation and circular economy practices can encourage eco-innovation in SMEs, especially when companies are able to integrate external knowledge with sustainability practices. In addition, it emphasizes that circular business model innovation requires practices and transition paths that are able to change the way companies create, deliver, and capture value in the context of sustainability. (Utami et al., 2024) (Worakittikul et al., 2025) (Izquierdo-Montfort & De Rongé, 2025)

Theoretically, this research strengthens the understanding that circular economy adoption in MSMEs and the eco-creative sector requires integration between external capabilities and internal capabilities. Collaborative innovation represents external capabilities because it allows artisans to gain support from outside the organization. Resource bootstrapping represents internal capabilities because it allows craftsmen to optimize limited resources. When both are present at the same time, artisans have a greater chance of adopting the circular economy in real terms.

The main contribution of this study lies in the placement of bootstrapping resources not only as an independent variable, but also as a moderation variable. This shows that resource bootstrapping has a dual role. First, resource bootstrapping directly encourages circular economy adoption because it helps artisans utilize available materials, assets, and networks. Second, resource bootstrapping strengthens the influence of collaborative innovation because it helps artisans execute the results of collaboration into circular business practices.

The practical implication of these findings is that circular economy development programs in the eco-creative sector are not enough to be carried out only through socialization, training, or network expansion. The program should be designed to strengthen the ability of artisans to mobilize resources. The government, universities, creative communities, and MSME companion institutions need to help artisans not only understand the circular economy, but also practice it through cheap prototyping, local waste utilization, product design based on residual materials, production process efficiency, and circular product marketing strategies.

Thus, circular economy adoption in the eco-creative sector needs to be understood as a capability process, not just an awareness process. It is not enough for artisans to be given knowledge about the importance of sustainability. They also need to be given access to collaboration and the ability to turn limitations into value. This is the crux of the study's findings: collaboration opens up opportunities, bootstrapping turns those opportunities into practice, and the combination of the two drives stronger adoption of the circular economy.

Acknowledgement

The authors would like to express their sincere gratitude to all eco-creative craft entrepreneurs who participated as respondents in this study. Their willingness to share experiences, insights, and business practices related to collaborative innovation, resource bootstrapping, and circular economy adoption has provided valuable support for the completion of this research.

The authors also extend appreciation to the local craft communities, SME facilitators, and relevant stakeholders who contributed directly or indirectly by providing access, information, and support during the data collection process. Their involvement helped enrich the understanding of how circular economy practices are developed within resource-constrained eco-creative sectors.

Finally, the authors gratefully acknowledge the academic colleagues and institutional support that assisted in the refinement of the research design, theoretical framework, and manuscript preparation. Any remaining limitations in this study are entirely the responsibility of the authors.

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