Introduction

China's rapid economic development has resulted in increased resource exhaustion and environmental dilapidation during the last three decades. Resultantly, the circular economy (CE) was developed in 1998 and then recognised as an official economic strategy by the Chinese central government in 2002 (Llorente-González & Vence, 2019). Following that was the enforcement of the Chinese CE promotion law which went into effect on 1 January 2009, thus establishing China as a pioneering implementer of CE-related laws. CE is a concept that encourages long-term economic growth while avoiding serious environmental and resource constraints. The argument is that economic systems could and must work in the same way that natural systems do in terms of materials and energy cycling. CE also emphasizes the recycling of vital resources and energy, on top of the ability of a firm’s waste to be utilized as a resource by a different firm via self-organization capabilities. The CE concept's successful implementation has been identified as a possible solution for China to engage in environmental protection and
thus repair the ecological harm due to hasty development (Singh & Giacosa, 2019). In general, CE employment can be divided into three: (1) macro-level eco-regions, (2) meso-level eco-industrial parks (Peronard & Ballantyne, 2019), and (3) micro-level eco-enterprises.

Micro-level wise, CE entails environmental protection criteria such as reducing, reusing, and recycling (3Rs), with a focus on attaining the twin goals of boosting environmental and economic performance. A variety of corporate-level (micro-level) efforts including manufacturing plants eco-design, waste reduction, clean production, and environmental management systems (EMS) are typical activities at this level. Throughout the whole life cycle of their manufactured goods, businesses' operations have significant environmental consequences (Tesfaye & Kitaw, 2021). For environmental management practises to flourish, it is critical that businesses collaborate within the supply chain. Environmental supply chain collaboration (ESCC), which emphasizes eco-efficiency cooperation between customer and supplier, has recently risen to prominence among Chinese businesses as a strategy for boosting their performance both environmentally and economically. Multiple inquiries have demonstrated that such supplier-customer collaboration can help businesses boost their environmental performance as well as increase economic performance in supply chain management (Paiho et al., 2020).

CE and ESCC methods, on the other hand, are not yet widely used in Chinese manufacturing companies. One likely reason is China's lack of understanding of CE best practises, particularly the necessity to integrate ESCC standards. Furthermore, existing CE studies and ESCC studies had been carried out independently, with little consideration for their coexistence or potential performance implications in an integrated context. Xia and Ruan (2020) discovered that manufacturers who differ in their ESCC implementation also differ in their CE implementation, and that the accomplishment of CE performance was determined using the cluster analysis and multivariate analysis of variance (MANOVA). However, it is uncertain if ESCC is beneficial or necessary for CE procedures to increase performance. A moderator effect shows that either one can improve or reduce the association between an independent practice (for example, CE) and the outcome of a dependent performance. A mediation effect, on the other hand, implies that a mediator (for example, CE) is required for an independent practice (for example, ESCC) to affect the outcome of a dependent performance (Baron & Kenny, 1986). By studying the moderating influence of the former on the link between CE practice and CE performance, this article specifically determines whether ESCC can help manufacturing firms in utilizing the contributions of CE. Additionally, we investigate whether ESCC practices play a mediating role in the said relationship and whether they are necessary drivers for manufacturing firms to achieve the desired results of applying CE standards. To guide this research, we first create a conceptual
model that links ESCC and CE to performance. The research methodology is explained next, along with the study findings and implications. The study is concluded with a review of the findings and recommendations for further research in this area of environmental management.

**Conceptual Framework**

As previously stated, the existence of ESCC can amplify the impacts of applying CE on CE performance. We develop a conceptual framework as a guideline in investigating the moderating and mediating functions of ESCC in the relationship between CE and manufacturing performance. Internal Environmental Management (IEM), Eco-Design (ECO), and Corporate Asset Management and Recovery (CAMR) are three important characteristics of CE practices that we include in our research model. IEM is critical to enhancing an organization's environmental performance (Kapsalis et al., 2019). IEM is a significant part of CE implementation amongst Chinese manufacturing businesses, parallel to the performance metrics for industrial CE evaluation (Min et al., 2021). Another major CE practice is ECO, or environmental design, which is a possible method for improving eco-efficiency. Currently, in China, environmental management has been expanded to incorporate the reusing and recycling of the entire lifecycle of products and services, in order to bridge the supply chain gap (Salmenperä et al., 2021). As a result, it is fair to view CAMR as a key component of CE, as it incorporates management techniques such as reuse and recycling. Supply chain partners in both upstream and downstream are considered for ESCC activities, which incorporate green buying (GP) and customer cooperation (CC) along with environment-related issues.

**Environmental Supply Chain Cooperation as a Moderator**

The term "moderating effect" refers to the ability of a variable modelled as a moderator to increase or diminish the independent-dependent variable link. Suppliers and customers can benefit from increased performance when they work together with their supply chain partners to carry out environmental management, like CE standards, in a manner that is timely and economical (Singhal et al., 2020). Collaborative organizational initiatives like supplier collaboration to reduce the environmental load of production and processes can aid in reducing unwanted waste and inefficiencies in supply chain activities (Micheli et al., 2020). Manufacturers have taken to ESCC, a broad supply-chain management technique with the aim of reducing environmental damage while improving operational efficiency (Cousins et al., 2019). In accordance with this reasoning, we claim that ESCC practices operate as positive modifiers, enhancing the positive
impact of CE in boosting the performance of manufacturing firms, both environmentally and economically. For example, to increase supply chain responsiveness, Nissan built an automotive demand chain with the support of a collaborative network of enterprises, which connects production facilities with dealerships to ensure quick delivery. To maintain supply chain agility, such an operational plan necessitates cooperation from suppliers and customers. The importance of supplier and customer engagement emphasizes the mediating function of partner collaboration in achieving the company’s goal of building a receptive supply chain. As a result, supplier collaboration is critical for manufacturing companies to increase their environmental-based performance while also meeting quality and cost targets (Isnaini et al., 2020). The non-existence of external ESCC practices, like customer and supplier collaboration, could jeopardise an organization’s long-term internal profitability. Jermsittiparsert et al. (2019) utilise the seafood supply chain to highlight how inadequate environmental management practices (with poor partner engagement planning) and overfishing can result in declining supplies and, as a result, disrupting the supply of seafood. This study believes that ESCC activities serve as mediators, and that they are necessary components of CE in order to obtain environmental and economic benefits.

![Diagram](image-url)
Internal Environmental Management (IEM), Eco-Design (ECO), and Corporate Asset Management and Recovery (CAMR) are three important characteristics of CE.

Conclusion

China has suffered major environmental consequences as a result of prior industrialization strategies that focused on productivity. This dilemma emphasizes that effective industrialization policies are critical, and that resource management and a more environmentally responsible development strategy for environmental preservation should be prioritized. CE makes it possible for manufacturing companies to pursue more environmentally friendly kinds of development by enhancing their total eco-efficiency. CE fosters eco-design, greener production, and responsible waste management at the corporate level, lowering both virgin material consumption and emissions. Our findings show that ESCC policies stressing customer-supplier collaboration are highly significant, if not critical, for Chinese firms to attain success, environmentally and economically, through their CE practices. Supply chain actors, for example, can aid in improving environmental performance throughout the product life cycle (Arora et al., 2020). The Chinese government ought to adopt ESCC-driven policies for the manufacturing industry, on top of encouraging organizational CE practices. For instance, the Chinese government can assess energy intake and emissions cut-down for individual manufacturers' operations, as well as the effects of their manufactured products' lifecycle, which includes both suppliers and buyers. According to the survey findings, the level of adoption of ESCC procedures in the Chinese manufacturing industry lags behind that of CE practices. In terms of the specified performance goals both environmentally and economically to be attained by a CE, it is critical for the Chinese government to promote both CE and ESCC practices to improve eco-efficiency. The promotion and industrialization of ESCC among Chinese manufacturers could help the country create a CE.

This study builds on the findings of Del Giudice et al. (2021), which concentrated on the identification of firms with greater levels of ESCC practice. On the academic front, we have looked at how ESCC practices can moderate and mediate the CE-performance link. In practice, we tell manufacturers that if they want to increase performance through CE procedures, they must follow particular ESCC practices. For Chinese industries, there are several managerial consequences as well in terms of continual environmental management improvement. Customer cooperation with environmental concerns, among other things, is required for the CE practices to achieve environmental performance. GP does not mediate the ability of CE to increase environmental performance, thus implying the nonrequirement for GP by CE practices to improve
environmental performance. However, the fact that GP has a moderating effect on the CAMR-performance relationship suggests that it is useful for increasing environmental performance. In their attempts to enhance the environment, Chinese manufacturers must consider the necessity of customer collaboration. CC is required for IEM and CAMR to increase economic performance, whilst GP is required for the three CE procedures to achieve the said objective (Kalyar et al., 2020).

Our findings emphasize the significance and requirement of ESCC practices in enabling manufacturers to achieve the full potential of CE procedures in terms of both environmental and economic performance. Manufacturing companies that have executed or plan to execute CE procedures must not underestimate the importance of supply chain collaboration in achieving CE-targeted results.

References:


