Assessing Chinese Fashion Organizations' Change Readiness for the Circular Economy (FashionReady4CE): Development and Validation of FashionReady4CE Scales

Abstract

The Chinese fashion industry's environmental impact has led to calls for a transition from a linear economic model to a circular economic (CE) model. However, it remains uncertain if Chinese fashion organizations are ready to make this change. This study addresses this gap by exploring "change readiness" as an understudied construct in the CE literature to aid researchers, practitioners, and policymakers in assessing Chinese fashion organizations' readiness to transition to the CE (i.e., FashionReady4CE). Using organizational readiness for change as the theoretical framework and item response theory as the methodology, the FashionReady4CE scales were formulated. Through a comprehensive integration of qualitative and quantitative methods, a robust set of FashionReady4CE scales was developed, encompassing 25 scale items that originated from four key constructs: change commitment and change efficacy, which jointly form change readiness, along with change-related effort and implementation effectiveness pertinent to the CE. The validated set of FashionReady4CE scales holds important implications for academic researchers, fashion industry practitioners, and policymakers, empowering them to successfully shift toward the CE.

Keywords: Circular economy, circular fashion, sustainable fashion, change readiness, scale development, Item response theory

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1. Introduction

Governments and business leaders alike increasingly acknowledge the marked need for fashion organizations to fundamentally shift from the extractive "take-make-use-dispose" linear economy (LE) to a sustainable "take-make-use-reuse again and again" circular economy (CE; Legl, 2022). Under the LE system, fashion (including textiles and apparel) organizations have contributed substantially to environmental degradation through their heavy use of natural resources and the pollutants released into ecological systems when products are manufactured (McDonough & Braungart, 2002). While numerous fashion organizations recognize the considerable ecological and societal damage attributed to the LE, they continue to operate in a linear way with only 1% of clothing being recycled and a mere 3.5% of the entire fashion market allocated to resale, rental, repair, and remaking endeavors (Brown, 2023).

As the world's largest producer and exporter of clothing and textiles, China holds a crucial position in the global fashion value chain. In 2022, China's 42,000 fashion companies collectively amassed an annual revenue exceeding 600 million RMB (approximately $82B USD; China National Garment Association, 2023), reflecting the strong position and growth of China's fashion industry. However, this remarkable growth has sparked significant challenges. One of the more pressing concerns is the increasing consumption of resources and the resulting environmental impact associated with China's prevalent LE system. According to a recent report by the China National Resources Recycling Association (CRRA), approximately six million tons of textile waste were generated in China in 2021 alone (CRRA, 2022), while only 4.15 million tons of this massive amount were collected for potential reutilization in 2022 (CRRA, 2023).

In response to this pressing issue, the Chinese government has taken significant strides to facilitate a shift toward the more sustainable CE. The government recently issued an ambitious directive to achieve a recycling rate of 25% for waste textiles and produce two million tons of recycled fiber by 2025 (The State Council of the People's Republic of China, 2023). As a result, some fashion organizations have begun to adopt innovative circular business models, treating clothing as a service (e.g., rental or subscription clothing models) rather than a mere product (Kristoffersen et al., 2021). Furthermore, other organizations have embraced circular practices by offering take-back programs, wherein customers receive discounts on future purchases when they recycle their clothing. Despite these efforts, there remains uncertainty regarding the overall readiness of fashion organizations, particularly Chinese fashion organizations with varying capabilities, to fully integrate and embrace the CE as a central strategy in their business operations.

The CE has not only gained significant momentum within the fashion industry but has also emerged as a subject of significant scholarly interest among fashion researchers. Scholars have investigated a wide range of CE-related themes in the fashion sector, exploring how circular disruption can and has taken place. Previous research has predominantly focused on four key streams within the fashion industry: circular supply chains, circular design, consumer perceptions toward circular fashion, and circular business models. For example, Franco (2017) extensively examined the various complexities and challenges in supply chains associated with fashion circularity. Meanwhile, Goldsworthy et al. (2018) assessed both industry practices and the academic literature to propose a novel framework for circular fashion design. Camacho-Otero et al. (2019) documented how consumers primarily expressed concerns related to economic factors, such as the price, associated with circular fashion practices, particularly in the context of clothing rentals. Previous research has also focused on the exploration of

innovative circular practices (Weissbrod & Bocken, 2017), and the conceptualization and implementation of circular business models (Bocken et al., 2017).

While the current literature has made significant efforts to enhance the adoption of CE within the fashion context, encompassing perspectives from both businesses and consumers, a notable gap remains in comprehensively evaluating and understanding the change readiness of fashion organizations to transition to the CE, particularly in China. Instead, the existing literature tends to prematurely focus on their change-related efforts and implementation effectiveness. Change readiness is comprised of change commitment (i.e., how much an organization values change) and change efficacy (i.e., an organization's ability to effect change), toward the CE. Considering that Saha et al. (2021) have acknowledged internally-motivated commitment and change capability as essential prerequisites for a successful transformation to a CE from a LE, it is imperative to assess the change readiness of fashion organizations in China toward the CE. This leads to an important research question: Are Chinese fashion organizations prepared for the transition toward the CE (hereafter referred to as "FashionReady4CE")?

To address this question, this study focuses on the concept of change readiness, a relatively underexplored construct in the CE literature. Change readiness refers to a fashion organization's commitment and efficacy in adapting to change, laying the foundation for the successful execution of complex changes, such as a transition to the CE (Weiner, 2009). Complex changes are most likely to succeed when the motivation to change comes from inside the organization rather than from external pressures (Weiner, 2009). To facilitate a change from within, fashion organizations must possess a reliable method to measure and assess their state of change readiness. In recognition of this crucial need, this study developed and validated a set of FashionReady4CE scales, specifically designed to measure the change readiness of Chinese fashion organizations. By utilizing the validated set of constructs and corresponding

FashionReady4CE scales created in this study, academic researchers, fashion business practitioners, and policymakers can accurately assess Chinese fashion organizations' change readiness, efforts, and effects in adopting circular practices. This assessment provides insight into each organization's specific position on the change readiness scale, facilitating a customized approach to drive transformative change toward the CE.

In the next section, the existing CE literature is reviewed, followed by a discussion on the Theory of Organizational Readiness for Change (ORC), which serves as the theoretical framework for the development of the FashionReady4CE item bank[1]. In section three, the methodological framework of Item Response Theory (IRT) is explained, which was employed in the development and validation of the FashionReady4CE scale items. In section four, the findings and outcomes of the FashionReady4CE scale validation process are detailed. Finally, in section five, the implications of this study's findings to further fashion organizations' transition to the CE are presented and discussed.

2. Literature review

2.1. Review of CE literature

The current CE literature related to fashion delves into various aspects, including circular supply chains, circular design, consumer perceptions toward circular fashion, and circular business models. Within the circular supply chain literature, studies have identified barriers to transition supply chains to the CE (Kirchherr et al., 2023), such as a focus on output over input (Hartley et al., 2020). To tackle these challenges, Henry et al. (2021) identified that collaboration-driven startups are better suited to overcome these barriers. Regarding circular design, research has explored ways to prolong garment lifespans (Goldsworthy et al., 2018), and how these practices support fashion companies in their transition to the CE (D'Itria & Aus,

[1] An item bank refers to a compilation of scale items used to determine the position individuals along a continuum of the item being measured (Reeve & Fayers, 2005).

2023). In the CE literature centered on consumer perceptions, challenges arise from consumer resistance to purchasing circular goods (Becker-Leifhold & Iran, 2018). Ikram (2022) proposes that companies must educate consumers to promote circular consumption. Another stream of literature demonstrates that circular business models enhance an organization's ability to transition to the CE by fostering novelty and innovation (Papamichael et al., 2023). However, these models also face challenges, including managing consumer and retailer expectations in fashion resale markets (D'Adamo et al., 2022). Circular startups play an important role as key drivers of industry-wide circular disruption (Henry et al., 2021), transforming harmful linear systems into waste- and resource-reducing models. To achieve true disruption, circular business models need to go beyond low-value-add strategies like recycling, and embrace high-value-add strategies such as reduction and regeneration (Henry et al., 2020).

Moving the industry forward requires a change in the approach scholars take in conducting research. Kirchherr and Van Santen (2019) noted that considerable gaps exist in empirical work that provide practical aid for businesses to transition to the CE, with many CE-related studies focusing on developed economies. To improve research impact, researchers should focus on developing economies, such as China (Henry et al., 2023). Further, researchers should tailor their studies to cater to practitioners, as current research primarily targets other academics (Kirchherr & Van Santen, 2019). Hartley et al. (2022) identified the absence of a tool to measure readiness for CE change as a notable research gap. Acknowledging the urgency and significance of firms transitioning to the CE, this study seeks to fill this significant gap by developing and providing an actionable set of FashionReady4CE scales tailored for Chinese firms.

2.2. Theory of organizational readiness for change (ORC)

ORC theory (Weiner, 2009) was used to identify the key components for developing the item banks from which the FashionReady4CE scales were created. ORC is based on the

premise that organizations encounter unexpected, continuous change, and therefore must embrace and readily adapt to change on their own accord. This internally-driven motivation to adapt fosters a higher level of commitment to change, which allows organizations to persist through the various obstacles and unknowns that often lead to change implementation failure (Vakola & van Dam, 2019). However, a willingness to change is not sufficient; organizations must also exhibit the capability to change. To demonstrate both willingness and capability to embrace change on their own, organizations should remain in a continuous state of change readiness (Rowden, 2001).

Change readiness refers to how prepared an organization is to execute change. More specifically, it refers to the degree to which an organization understands the need to make a change and has both the motivation and capability to enact change (Holt & Vardaman, 2013). Hence, the change readiness construct should measure both change commitment and change efficacy (a state of being behaviorally prepared to respond to change; Holt & Vardaman, 2013). Change commitment refers to an organization's psychological motivation to change, such as whether the organization believes the change is important or worthwhile, or whether it values the change enough to make a commitment to implement it. Change efficacy refers to an organization's ability to engage in a course of action necessary to make a change, including whether it has the resources (e.g., human or financial resources) necessary to implement the change. Change readiness, encompassing both change commitment and change efficacy, is requisite for organizations to succeed in implementing change, as change inherently challenges efficacy through inevitable obstacles that arise during the change process (Holt & Vardaman, 2013).

Proposing that change readiness occurs across two states, ORC further posits that change readiness results in two outcomes: change-related efforts and implementation effectiveness (Weiner, 2009). Change-related efforts include the cooperative and championing

behaviors an organization exhibits toward change and is a precursor to implementation effectiveness, which refers to the consistency and quality of change-related outcomes. For example, when an organization's readiness for change is high, the organizational members are more likely to initiate change, exert greater efforts to implement the change (e.g., institute new practices), and persist in change implementation, despite obstacles or setbacks. By contrast, when an organization's readiness is low or non-existent, it may resist change, put less effort into implementation, and withdraw when faced with challenges. Change-related efforts are expected to result in more effective implementation and thereby produce more desirable outcomes from the change (e.g., improved resource efficiency and recycling rates).

2.3. Content map development for the FashionReady4CE item banks

While ORC theory offers an overarching framework for understanding the major stages and constructs required for assessing an organization's change readiness, it does not explain the specific dimensions necessary to assess the change readiness of a fashion organization. To create the content map for the FashionReady4CE item banks, each stage of ORC specific to Chinese fashion organizations' change readiness, efforts, and effects concerning the CE was further elaborated. A systematic literature review was conducted to identify the underlying dimensions that are important for defining these organizations' change commitment, change efficacy, change-related efforts, and implementation effectiveness toward the CE.

A systematic literature review was conducted to identify the critical resources, practices, and consequences related to fashion organizational shifts to the CE. In the inclusion criteria, "organizational readiness for change" and "CE" were used as the search keywords; Google Scholar as the database; journal articles, conference papers, theses, and reports as sources; English as the written language; and 2008 to 2021 as the publication period. This initial search yielded 24,700 and 17,800 results for each keyword, respectively. The research team assessed the title and abstract of the articles suggested by the database, considering their

relevance and applicability to this study, and sorted out those articles that were not related to ORC, fashion organization's sustainability, or circular behavior. For example, the authors excluded articles that merely mentioned ORC but did not adopt ORC as their theoretical framework. Articles discussing biological technologies for CE implementation, which are important for the engineering of biological processes but not for fashion organizations or their practices, were also excluded. After applying the inclusion and exclusion criteria, 54 articles remained. The team then reviewed the full content of the articles and listed all the dimensions of the underlying resources, practices, and consequences of the CE, or ORC constructs, in a spreadsheet. If the articles did not include any measurement, critical resources, practices, or consequences related to an organization's transition to CE, they were excluded.

From the review findings, 16 fashion domain-specific dimensions in the four constructs of ORC were identified. Within the construct of change commitment, the authors identified two dimensions: change valence and engagement intent toward the CE. The team found five dimensions under the construct of change efficacy: financial capability, human resource capability, knowledge capability, operational capability, and technological capability. Within the change-related effort construct, six dimensions were identified along the fashion value chain: eco-design, green sourcing, cleaner production, innovative business models, waste management, and customer engagement. Lastly, the construct of implementation effectiveness encompassed three dimensions: environmental effect, economic effect, and social effect. Each of these constructs and their associated dimensions are discussed in more detail below.

2.2.1. Change commitment

For fashion organizations, change commitment toward the CE occurs across two dimensions of change valence and engagement intent toward the CE (see Table 1). *Change valence toward the CE* describes how fashion organizations shift the way they perceive and value the CE (Bertassini et al., 2021). Fashion organizations may initially resist transitioning

to the CE because of the significant adjustment required in how they produce goods (Abdelmeguid et al., 2022). However, as they become more aware of the benefits of the CE, their change valence may become more positive (Bertassini et al., 2021). *Engagement intent toward the CE* depicts their intent to engage in CE-related action (Nguyen & Biderman, 2008), such as fostering an organizational culture to garner collective support to transition to the CE.

2.2.2. Change efficacy

Change efficacy is defined as the capacity to enact change and encompasses five dimensions of financial, human resource, knowledge, operational, and technological capabilities (see Table 1). *Financial capability* refers to the resources a fashion organization has available to build the capacity to transition to the CE (Abdelmeguid et al., 2022). For example, a fashion organization with financial capability has the capital to invest in textile recycling or purchase higher-cost recycled textile material for use in production. *Human resource capability* describes the CE-related skills and knowledge of a fashion organization's employees (Pathak & Endayilalu, 2019). Because transitioning to the CE requires a high degree of eco-literacy, having qualified employees is essential for fashion organizations (Kazancoglu et al., 2020). *Knowledge capability* signifies a fashion organization's collective competency to transition to the CE (Bertassini et al., 2021), such as the technical knowledge of how to transition production processes to align with the CE. Knowledge capability is an important differentiator for fashion organizations, providing an advantage over competitors (Zott, 2003). *Operational capability* depicts a fashion organization's ability to effectively perform the tasks and functions required to produce products in a circular manner (Ünal et al., 2019). For example, to close the loop on production, a fashion organization must find other avenues for its products at its end-of-life stage, such as take-back programs. *Technological capability* refers to a fashion organization's ability to develop and use scientific advancements to transition to

the CE, such as employing regenerative practices to restore the health of an ecosystem (i.e., organic cotton farming) or using recycled materials (Vecchi, 2020).

2.2.3. Change-related effort

Fashion organizations' change-related effort toward the CE describes the coordinated action to enact change in their supply chains and takes place across the six dimensions of eco-design, green sourcing, cleaner production, innovative business models, waste management, and customer engagement (see Table 1). *Eco-design* encompasses designing products to consider environmental impact and material flows and includes practices such as using renewable or regenerative materials, and designing for longevity, disassembly, recycling, or decomposition (Dissanayake & Weerasinghe, 2022). *Green sourcing* entails the purchasing efforts of a fashion organization to align with the CE, such as using suppliers with environmental certifications (Kuo & Chang, 2021). Fashion organizations exhibit efforts toward *cleaner production* by minimizing their environmental impacts, such as utilizing non-toxic materials in their products and renewable energy sources in their production processes (Colucci & Vecchi, 2021). To sell circular products, fashion organizations must institute *innovative business models*. These entail creating new streams of revenue through approaches like rental programs (Ki et al., 2020), resale initiatives, and repair services, all of which are not dependent on the use of virgin or disposable products (Dissanayake & Weerasinghe, 2022). Resale, recycling, and remanufacturing are important *waste management* practices that fashion organizations adopt to align with the principles of the CE, while rental programs and repair services provide an opportunity for *customer engagement*, defined as promoting consumers' involvement in the CE (Abdelmeguid et al., 2022). Due to the convoluted and complex nature of the fashion value chain, these six dimensions are all key considerations of change-related efforts toward the CE as fashion organizations aim to close the material loop.

2.2.4. Implementation effectiveness

Implementation effectiveness constitutes the consistency and quality of fashion organizations' transition to the CE and includes environmental effects, economic effects, and social effects (see Table 1). A fashion organization's change efforts toward the CE can produce significant and positive *environmental effects* by taking back their products at their end-of-use life for either recycling or reselling, which keeps goods out of landfills (Stål & Corvellec, 2018). This same effort also results in positive *economic effects* as the fashion organization saves on materials costs or generates revenue through secondhand sales (Leal Filho et al., 2019). Fashion organizations have direct contact with consumers at the point of sale; as such, their CE-related outcomes can influence the mindsets and cultural practices of consumers to align with the principles of CE, creating *social effects* (Leal Filho et al., 2019). Environmental, economic, and social effects are important components of change implementation toward the CE because collectively they determine whether an organization's change-related efforts effectively achieve their intended purpose.

== Insert Table 1 about here ==

3. Method

3.1. Item response theory (IRT)

This study employed Item Response Theory (IRT) as its methodological framework to develop and assess reliable and valid scales, enabling the measurement of Chinese fashion organizations' change readiness, efforts, and effects toward the CE. IRT is a statistical and psychometric framework that examines the relationship between individuals' responses to specific items in a questionnaire and their underlying latent traits (Wang et al., 2022). The choice of IRT as the methodological framework was driven by three main reasons. First, unlike classical test theory, IRT operates at the individual item level, providing insights into both the performance of each item and the underlying latent trait levels of respondents. By accounting for the interaction between each item and the respondents, IRT provides a more comprehensive

understanding of scale performance, resulting in a greater degree of generalizability for the developed scale in comparison to classical test theory (Reeve & Payers, 2005). Second, IRT possesses the advantage of making scale items and their parameters invariant of the population, which makes scale construction more meaningful for organizational behavioral and psychological research (Foster et al., 2017). That is, scale items developed by IRT maintain their measurement abilities even when used with varying samples, which is key to measuring the multilevel, multidimensional constructs, where the context varies from organization to organization, especially in the Chinese fashion industry. Lastly, IRT facilitates item calibration, mandating the qualitatively developed scale items be empirically tested. By checking the IRT assumptions and items' psychometric properties, IRT ensures that only informative items are retained in the scale. This mixed-method approach improves the validity of the measures and enables the removal of items with unacceptable psychometric properties.

The item bank development process followed the IRT protocol outlined by Goswami et al. (2018). Figure 1 presents an overview of the scale development procedure, guided by IRT, which involved: (a) item generation and initial purification, (b) content validation through expert judgment, and (c) psychometric evaluation and scale refinement and validation. The following sections provide details of each step, including the procedures undertaken and the results obtained.

== Insert Figure 1 about here ==

3.2. Scale development and validation procedure

3.2.1. Phase 1: Item bank generation and initial purification

The purpose of Phase 1 was twofold. First, it was to collect and generate the initial pool of potential items (Likert scale-type questions or statements) for each item bank based on the content map. Second, it was to purify the initial item pool and assure their validity through

binning[2] and winnowing[3]. The main sources of the preliminary FashionReady4CE item pool collection included previously developed and published items. The research team reviewed the full content of the articles identified in section 2.2. and documented the scale items these articles developed or used, including the information about their original construct name and response option. During this procedure, items that were irrelevant to ORC or sustainable fashion organizational behavior were excluded from the initial item pool. For example, items that measured consumers' sustainable consumption behavior, but not the business organizations' sustainability practices or efforts, were excluded. From this initial item bank generation stage, 646 potential scale items from 37 articles were collected. Table 2 provides a few examples of the original items collected.

To purify the initial item banks and ensure their face validity, a series of qualitative sub-phases of organizing and evaluating the items, namely binning and winnowing, were conducted (DeWalt et al., 2007). In the binning stage, the research team systematically grouped (binned) the 646 items according to their similarity in meanings, constructs, or dimensions. For example, items that have been broadly used in sustainability research to measure a company's intent to implement CE practices were identified and sorted within the item bank for change commitment. Items that did not fit into the constructs or dimensions established in the content map were set aside. Through the process of binning, the authors removed any redundant or irrelevant items from the pool and identified strong potential items conforming to the content map.

[2] Binning refers to systematically "grouping" items according to the item's content and specific latent variable (Revicki et al., 2014).

[3] Winnowing refers to the process of "reducing" the number of items in each bin or category, eliminating redundant items and retaining only those items that represent the domain (Revicki et al., 2014).

Subsequently, the authors further reviewed the final set of items in each of the bins to ensure content coverage. Each item was systematically reviewed by the research team who reduced (winnowed) the larger pool of items into a smaller set of items based on a set of criteria to retain only those items that are most relevant to each construct or dimension. The specific criteria for identifying problem items were as follows: (a) the item content is inconsistent with the definition of the construct or dimension it is intended to measure; (b) the item is semantically redundant in nature with another item; (c) the item content is too narrow to be generalizable; and (d) the item content is confusing to understand. During the winnowing process, three research team members reviewed the items and recurrently decided to eliminate specific items within each construct or dimension until they reached the same judgment. Through this process, 435 items were eliminated as they did not align with the construct or dimension definitions and structure, and another 135 items were removed because of their redundancy or narrow generalizability. Overall, this item purification process resulted in a smaller set of 76 scale items that are more representative and manageable: (a) 11 items in change commitment; (b) 22 items in change efficacy; (c) 26 items in change-related efforts; and (d) 17 items in implementation effectiveness (see Table 3).

== Insert Table 2 and Table 3 about here ==

3.2.2. Phase 2: Content validation through expert judgment

The second phase of the study was advanced in three steps: (a) content expert validation, (b) item revisions, and (c) cognitive interviews. The purpose of content expert validation was to assure the content validity of the reduced pool of items by conducting a focus group interview with Chinese fashion industry professionals to help avoid the research team's subjective errors and to identify new important item(s) that might have been omitted from the literature (Revicki et al., 2014). Since this study's research domain focuses on the Chinese fashion industry, nine Chinese fashion firm managers, who have authority in the organizational

decision-making of CE adoption, were recruited as experts and attended the focus group session for reviewing the item banks. To ensure they had sufficient working experience within industry, only those who are working at the level of department manager or higher and have at least four years of working experience in the Chinese fashion industry were invited. As a result, nine experts from varying firm types, firm sizes, job positions, and work experience participated in the unstructured focus group interview (see Table 4).

== Insert Table 4 about here ==

To facilitate the focus group interview, the authors modified all the items to represent the fashion business context considering the initial items were generated with scales and questions across various research domains. For instance, the item "willingness to accept suggestions from the workers to improve the implementation of reuse, recycle, and remanufacture in the process of managing wood waste," was revised to "willingness to accept suggestions from the workers to improve the implementation of reuse, recycle, and remanufacture in the process of managing textile waste." Subsequently, one of the co-authors, who is a native Chinese speaker, translated all 76 items from English into Chinese. Another co-author, who is fluent in both Chinese and English, back-translated the items from Chinese to English. No major revisions were made.

With the translated items, a focus group session was conducted. The expert participants were first asked to read the translated items carefully and for as long as they needed. After they read through the 76 items, each expert was asked to (a) share their opinions regarding each item and its connection with the core concept of the associated item bank; (b) assess the extent to which the items represented their real-life experiences; (c) assess the wording and vocabulary of the items; (d) share the perceptions those items might generate, and (e) share their experiences related to the items. Items that the experts indicated as questionable were marked as problem items. Problem items identified by the experts included items that had

limited association with the core concept and items that lacked clarity. For example, one expert indicated that the item "Our firm (we) increased the content or percentage of reused parts or recycled or renewable materials in manufacturing process," which describes an activity of the CE but not environmental effects, should be removed from the item bank of implementation effectiveness. In contrast, one new item emerged from the focus group. Four of the nine experts emphasized that expenditure on employee training could not be overlooked, especially when firms adopt new business practices (e.g., CE activities). Consequently, a new item "The firm has the financial capability to train employees to practice CE," was added to the item bank of change efficacy. After deleting five problem items and adding one new item, a total of 72 items remained at the end of Phase 2: (a) 11 items in the item bank of change commitment; (b) 22 items in change efficacy; (c) 25 items in change-related efforts; and (d) 14 items in implementation effectiveness.

In the second step of Phase 2, the research team conducted revisions to the item pool to ensure that the measurement model reflects a consistent response format, certain literacy level expectations, fewer cognitive difficulties, and less ambiguous statements. To achieve these objectives, the expert-validated items were standardized into a consistent five-point Likert scale. Response choices of "strongly disagree" to "strongly agree" were designed, so that a higher score indicated a higher level of the latent trait. To ensure the clarity and understandability of the standardized items, the research team invited a survey research expert who is a fashion business professor at a large university in the Midwestern United States with scholarly experience in corporate behaviors and the Chinese fashion industry. The expert was asked to review the items (n=72), including the instructions for participants to answer those 72 items, and to give feedback if any. No revision was required.

The purpose of the last step of Phase 2, which involved cognitive interviews, was to ensure that respondents could understand all the items and instructions for answering them.

Toward this objective, the research team developed a survey questionnaire and invited other interviewees to answer the 72 items as a regular survey. As shown in Table 5, 10 Chinese fashion business professionals were recruited. These professionals worked at the level of department manager or higher and possessed a minimum of three years of working experience in the fashion industry, from varying firm types and firm sizes. These 10 participants were invited to a follow-up cognitive interview to share their feedback about the ease of understanding the instructions, the items' comprehensibility, the relevance of response categories, and the overall survey design. The feedback from the participants confirmed that the survey design and all the items and instructions were clear and easy to understand and that no modification was required. The item distribution in Phase 2 is presented in Table 3.

== Insert Table 5 about here ==

3.2.3. Phase 3: Psychometric evaluation and scale refinement and validation

In this final phase, the authors developed a self-reported online survey questionnaire, including the 72 items derived from the previous stages, and administrated it through *wenjuan.com*. The purpose of this phase was to quantitatively validate the FashionReady4CE scales using a psychometric evaluation to (a) test for items' psychometric parameters, (b) assess the reliability of items and scales, and (c) create parsimonious scales.

3.2.3.1. Procedure and data analysis

The survey questionnaire consisted of two sections: (a) the introduction and screening sections and (b) the main survey section. In the first section, the definitions and examples of the CE in comparison with the LE were provided to help the survey participants clearly understand the context of this study. To ensure that the survey questionnaire only included respondents who were familiar with the study context, a multiple-choice screening question was included: "What system does the CE endorse?" Only those who selected the correct answer (i.e., CE operates on the "take-make-use-reuse again and again" system) were allowed

to move on to the next screening question. To guarantee that survey participants are decision-makers in the Chinese fashion industry, the survey company collected data from only those who: (a) have at least two years of work experience in the Chinese fashion industry (including jobs related to design, development, production, distribution, merchandising, retailing, sourcing, selling, and marketing of products in fashion firms), (b) work at the level of department manager or higher in a fashion organization for a year or more, and (c) have a role in the decision-making process of the organization's change implementation or CE adoption.

The data for this study were collected in March 2022 through *wenjuan.com*, a China-based market research firm that maintains its own panel of survey respondents, representing a diverse sample of the Chinese population. The research firm recruited managers from various fashion firms across the Chinese fashion industry, resulting in a total of 500 complete survey responses. In IRT research, a sample size of 10 participants for every item is considered a general guideline to determine the overall sample size (Revicki et al., 2014). Since each item bank had no more than 50 items, a total of 500 participants was deemed acceptable. Table 6 presents an overview of the demographic information of the survey participants.

== Insert Table 6 about here ==

Statistical analyses were conducted in R Studio. Analysis packages of multidimensional item response theory (MIRT) and procedures for psychological, psychometric, and personality research (PSYCH) were used to calculate the items' psychometric properties. As suggested in IRT research, the data analysis process includes IRT assumptions evaluation, item parameter calibration, and model fit assessment. Items that led to a violation of IRT assumptions, have poor item parameters or bad model fit, were deemed problematic, which could be purified from the item bank. The IRT model has three critical assumptions: (a) monotonicity, (b) unidimensionality, and (c) local independence (De Ayala, 2013). Monotonicity assumes that the probability of selecting an item should increase as the underlying level of the latent trait

(e.g., change commitment) increases, which was checked in this study by reviewing a nonparametric item response modeling process called Mokken Scaling (Mokken, 1971). Unidimensionality requires that all items should represent a single underlying latent trait, which was inspected using principal component analysis (PCA). The LD X^2 statistics of the item showed the residual correlations among the items after controlling for the effect of the dominant dimension and were used to confirm local independence of each item (Choi et al., 2014).

Once the IRT assumptions were confirmed, the graded response model (GRM) was selected to calibrate item parameters in this study. Compared with other IRT models, GRM can offer a flexible framework for modeling the participants' responses and fits well on unidimensional scales with polytomous response options (i.e., Likert scales; DeWalt et al., 2007). The GRM was formulated as:

$$P_i(x_i = k|\theta, b_i, a_i) = (1/(1+\exp[-a_i(\theta - b_{i,k-1})]) - (1/(1+\exp[-a_i(\theta - b_{i,k})])$$

Where $P_i(x_i = k|\theta, b_i, a_i)$ indicates the probability of choosing the response option of k. θ represents the latent trait measured by the scales, which denotes "change commitment," "change efficacy," "change-related efforts," or "implementation effectiveness" toward the CE in this research. a_i represents the item discriminatory parameter of item i, indicating the item's ability to differentiate among individuals with different levels of the latent trait. b_i represents the item location points on the latent trait axis, where a higher response category becomes more likely than a lower one.

In addition, the model fit was assessed from the level of the individual item and the overall scales (see Table 7). At the item level, the common statistic of S_X^2 was used to assess the fit of each item to the observed proportions of response (Orlando & Thissen, 2003). At the scale level, the authors followed the approach of Maydeu-Olivares and Joe (2014) by using M_2 statistics to detect the fitness of the assigned model to replicate the observed reality.

== Insert Table 7 about here ==

3.2.3.2. IRT assumption test

The three IRT assumptions were first tested within each item bank. For the assumption of monotonicity, the results indicated that participants with a high perceived latent trait tend to choose a high score response category in each item, confirming the assumption of monotonicity. However, related to the second assumption, when conducting PCA in each item bank, the results showed that the assumption of unidimensionality was not met in each item bank. Using the criterion of eigenvalue greater than 1, PCA yielded three principal dimensions for the item bank of "change commitment," accounting for 41.59% of the total variance; six principal dimensions for the item bank of "change efficacy," accounting for 47.51% of the total variance; seven principal dimensions for the item bank of "change-related effort," accounting for 45.27% of the total variance; and four principal dimensions for the item bank of "implementation effectiveness," accounting for 44.33% of the total variance. Additionally, none of the item banks met the assumption of local independence, as checked with LD X^2 statistics. According to Choi et al. (2014), if the LD X^2 is above 10, the item pairs were deemed to have local dependence. The results revealed that 33 item pairs in the item bank of "change commitment," 183 item pairs in the "change efficacy" item bank, 226 item pairs in the "change-related efforts" item bank, and 64 item pairs in the "implementation effectiveness" item bank exhibited high residual correlations beyond the critical value of 10. Consequently, the presence of IRT assumption violations necessitated an item bank refinement process.

3.2.3.3. Item bank refinement

IRT researchers suggest that the items with local dependence and the items loading on more than one dimension need to be flagged and stepwise dropped. Thus, to refine the item bank, items with the highest LD X^2 statistics in the item banks were flagged. Then, the item content and factor loading were reviewed. Items with general or ambiguous meaning in content,

or that had cross-loading on multiple dimensions, were deleted from the flagged items. Next, the IRT assumptions for the altered item banks were assessed again. This process was iteratively repeated in each item bank until all item banks met the IRT assumptions. This process yielded a total of five iterations in the item bank of "change commitment," 16 iterations in the item bank of "change efficacy," 18 iterations in "change-related effort," and eight iterations in "implementation effectiveness." As a result, 47 flagged and problematic items were removed from the item banks.

4. Results of final scales analyses

With the items that met the assumptions of IRT, the final FashionReady4CE scales were established, comprising a total of 25 items that assess "change commitment," "change efficacy," "change-related effort," and "implementation effectiveness" (see Table 7). The final scale for "change commitment" consisted of six items, represented by three items for change valence and three items for engagement intent toward the CE. The discrimination parameter of each item ranged from .72 to 1.03. Considering that the suggested value for discrimination was from .65 to 2.5 (De Ayala, 2013; Goswami et al., 2018), all six items were deemed to have acceptable discriminating power to measure participants' perceived change commitment. The result of the IRT model fit indicated a good fit of the data to the model ($RMSEA_2$ = .04, SRMR = .03, CFI = .99, TLI = .99), suggesting that the model well replicated the observed reality. At the item level, the $S\text{-}X^2$ statistic showed that all items had acceptable fit ($p > .05$).

The final scale for "change efficacy" consisted of six items, represented by one item for financial capability, one item for human resource capability, two items for knowledge capability, and two items for technological capability. The discrimination parameter of each item ranged from .75 to 1.19, suggesting all items have acceptable discriminating power. The results of the model fit ($RMSEA_2$ = .06, SRMR = .02, CFI = .99, TLI = .97) and item fit showed good fitness ($p > .05$).

The final scale for “change-related efforts” consisted of seven items, represented by two items for eco-design, one item for green sourcing, one for cleaner production, one for innovative business models, one for waste management, and one item for customer engagement. The discrimination parameter of each item ranged from .79 to 1.13, suggesting all items have acceptable discriminating power. The results of the model fit ($RMSEA_2$ = .06, SRMR = .03, CFI = .98, TLI = .99) and item fit showed good fitness ($p > .05$).

The final scale for “implementation effectiveness” consisted of six items, represented by three items for environmental effects, and three for economic effects. The items for social effects were removed during the item bank refinement process in section 3.2.3.3., as they exhibited local dependence and loaded on more than one dimension in the scale. All the items for environmental and economic effects have acceptable discriminating power as the discrimination parameter of each item ranged from .67 to 1.12. The results of the model fit ($RMSEA_2$ = .07, SRMR = .03, CFI = .91, TLI = .97) and item fit suggested good fitness ($p > .05$). Detailed information is shown in Table 7.

In IRT research, the reliability of a scale refers to the degree to which the scale can differ across the levels of the latent trait (De Ayala, 2013). The reliability of the FashionReady4CE scales was assessed by checking the amount of information available from the scale, derived from the item information function (IIF; De Ayala, 2013). Here, the information relates to the standard error of estimate (SEE) with which a parameter is estimated. Higher information or lower SEE denotes more precision (or reliability) a scale has in discriminating individuals among the latent traits. In this study, the amount of information generated from each scale was visualized as the curve of IIF and SEE in Figure 2.

Revicki et al. (2014) suggest that a scale is considered most informative or reliable across a range of a latent trait if the IIF curve gets relatively flat at the peak while the SEE curve stays low. As shown in Figure 2, the amount of information generated from each scale

reached a high position and stayed within the range of about −2 to +1. In this way, the scales exhibited greater reliability in assessing the latent traits as the measurement range stayed within approximately two standard deviations below and one standard deviation above the average level, while excluding extreme information. The reliability of each scale was therefore found to be acceptable.

== Insert Figure 2 about here ==

In addition, convergent validity was assessed and confirmed by checking the correlation between the final scales, and the goodness of fit in confirmatory factor analysis (CFA). As suggested by ORC, a high score in "change commitment" and "change efficacy" would lead to a high score of "change-related effort" toward the CE, and then lead to a high score of "implementation effectiveness." The Pearson correlation coefficient showed positive and significant associations between "change commitment" and "change-related effort" ($r = .56$, $p < .01$), "change efficacy" and "change-related effort" ($r = .55$, $p < .01$), and between "change-related effort" and "implementation effectiveness" ($r = .60$, $p < .01$). Moreover, the indices of goodness of fit in CFA were all acceptable, indicating that the scales can reliably replicate the data: χ^2 (271) = 347.46, $p < .01$, TLI = .95, IFI = .95, CFI = .95, SRMR = .02, RMSEA = .12. Overall, all the results suggest that the final scales are valid to assess change commitment, change efficacy, change-related effort, and implementation effectiveness.

Finally, a test-fairness assessment was conducted to gauge the impact of demographic variables on the final scales' measurement ability. Test-fairness stipulates that a scale generates the same or similar results regardless of the participants' demographic or background differences. In this study, the participants' responses among varying genders, ages, and firm types were tested by using the TSW likelihood ratio (Revicki et al., 2014). The findings showed that all scales generated the same or similar results when testing participants from different groups, suggesting that the scales are fair and unbiased concerning gender, age, and firm type.

5. Discussion

5.1. Conclusion and Implications

As demands to transition from the LE toward the CE increase from both regulatory bodies and consumers, Chinese fashion organizations are compelled to embrace this change. However, without a comprehensive understanding of their readiness to transition to the CE, their efforts may fall short. Although change readiness plays a significant role in determining fashion organizations' preparedness for CE adoption, the existing literature has overlooked a critical aspect: the importance of evaluating whether or not fashion organizations are motivated to transition to the CE on their own accord (Hartley et al., 2022). Instead, it has primarily concentrated on examining their change-related efforts (Franco, 2017) or the effectiveness of CE implementation (Camacho-Otero et al., 2019). This research addresses this gap by developing and introducing an actionable tool called the FashionReady4CE scales, designed specifically for Chinese fashion enterprises to assess their internal change readiness and drawing needed attention to the understudied, yet important construct of change readiness in the CE literature. This tool enables researchers, policymakers, and fashion organization leaders to proactively address the challenges of transitioning toward the CE, ensuring a successful and enduring shift to the CE. The meaningful contributions the FashionReady4CE scales make to both theory and practice are described in further detail below.

First, the FashionReady4CE scales delineate four critical procedural stages and along with their corresponding measurement scales that fashion organizations need to navigate to achieve a successful transition to the CE. These stages encompass change readiness, comprised of change commitment and change efficacy, followed by change-related effort and implementation effectiveness. The distinct contribution of this study lies in its scale development process, which heavily relied on an extensive systematic review. This facilitated the identification and mapping of underlying dimensions for each stage of ORC. An added

significant contribution of this study pertains to the scales' industry relevance. Through the validation and refinement of the scale items via expert interviews involving professionals within Chinese fashion firms, we confirmed the practical applicability of the FashionReady4CE scales in real-world contexts. The FashionReady4CE scales also fill a key gap in the tools available for industry by providing a way for practitioners in the Chinese fashion industry to precisely and comprehensively assess their change readiness, change-related effort, and implementation effectiveness. Applying insights from the existing literature to fashion organizations' transition to the CE fulfills a need for practitioners who want to measure their organization's change readiness. This need is particularly pressing given the rise in positive consumer sentiment toward the CE following the pandemic (Sarkis, 2020) and the growing consumer skepticism toward greenwashing by fashion companies (Adamkiewicz et al., 2022). Providing fashion organizations with the necessary tools to measure their level of readiness for adopting the CE, defining CE objectives, and implementing circular practices can be instrumental in differentiating them apart from their competitors. Furthermore, in today's competitive business landscape where circularity is gaining more awareness and salience among consumers, investors and other stakeholders, fashion organizations can gain a distinct advantage by leveraging the concrete data and measurable outcomes provided by the FashionReady4CE scales. This strategic differentiation may contribute to their increased goodwill and positive brand perception among consumers.

Second, the FashionReady4CE scales make a significant contribution to the literature as they have established validity and reliability within the distinctive context of the Chinese fashion industry. This contextual validation is important because transitioning to the CE varies not only among industries but also across countries and cultures, each holding distinct characteristics and complexities that demand specialized measurement tools. With a valid and reliable set of scales to assess the four stages of a fashion organization's transition to the CE

within the Chinese market, managers can use these scales to measure and monitor their progress in each stage. The FashionReady4CE scales enable managers to determine the obstacles and deficiencies within their organization, enabling them to transition successfully to the CE. Having this information allows them to act quickly to address these challenges, thereby conserving their valuable time and resources.

Third, in addition to benefitting fashion organizations, the FashionReady4CE scales also benefit researchers to further advance meaningful studies within the CE related to fashion. Using these scales, researchers can categorize Chinese fashion organizations into distinct groups based on their current stage of change readiness, such as CE performers, CE preparers, or CE apathetic entities. This segmentation provides new avenues for research by enabling scholars to conduct in-depth investigations into the specific practices of Chinese fashion organizations at different stages in their CE transformations. Researchers can enrich the depth of their studies concerning circular adoption within the Chinese fashion industry by understanding the unique opportunities and challenges faced by groups at different stages in their change readiness. Moreover, segmenting Chinese fashion organizations holds implications for policymakers who are seeking to promote the adoption of the CE within the fashion sector, as outlined in Table 8. By gaining a clear understanding of the various stages of change readiness among Chinese fashion organizations, policymakers can design tailored initiatives and incentives that address the distinct needs, motivations, and concerns of each group. Furthermore, the segmentation of fashion organizations facilitated by the FashionReady4CE scales will enable policymakers to strategically allocate their limited resources, prioritizing those organizations that genuinely need assistance in enhancing their change commitment and change efficacy. This could involve implementing initiatives like offering financial incentives or grants. In doing so, policymakers can create a conducive environment and support for fashion organizations to successfully adopt the CE. Furthermore,

as policymakers increasingly shift their focus away from disclosure-based policies toward enforcement of specific actions by fashion organizations (e.g., New York's Fashion Act and Ecodesign Rules), the FashionReady4CE scales could become vital tools for both policymakers and Chinese fashion entities, enabling them to effectively measure and track their advancements in regulatory compliance.

== Insert Table 8 about here ==

5.2. Limitations and directions for future research

Although this study has many contributions, it does present the following limitations. First, the constructed scales are developed exclusively for the Chinese fashion industry context, thereby raising concerns about external validity when attempting to generalize these scales to non-fashion industries or other countries. Future research should exercise caution when applying the FashionReady4CE scales to different industries or countries. Second, the reliability of the scales could be further enhanced by calculating test-retest reliability. By conducting test-retest reliability assessments, future research can ascertain the reliability of the constructs and their scales over time, thus contributing to the scale's stability. Furthermore, conducting additional confirmatory analyses on Chinese fashion firms would validate the scales' validity and applicability, offering further insights into the scales' performance and ability to capture underlying traits within the Chinese fashion business landscape. Moreover, for a more nuanced understanding of fashion organizations' change readiness toward the CE, future research could explore the factors that influence the intrinsic motivation and willingness within these fashion organizations. This additional insight will prove valuable to fashion business managers, aiding them to accelerate the adoption of CE practices.

Table 1.
The definitions of each construct and their dimensions

Construct	Definition	Dimension	Description
Change commitment	The motivation to enact change toward the CE	Change valence toward the CE	An organization's state of knowing or understanding of the CE and its value (Dembkowski & Hanmer-Lloyd, 1994). For example, rethinking the "take-make-waste" approach of the LE.
		Engagement intent toward the CE	An organization's intention to engage in a specific action related to the CE (Nguyen & Biderman, 2008), such as support for circular practices from mid-level managers.
Change efficacy	The capability to enact change toward the CE	Financial capability	An organization's availability of financial resources to transition to the CE (Aranda-Usón et al., 2019), for instance, the financial resources invested to change the business model to build capacity for participating in the CE.
		Human resource capability	The ability to acquire skilled and competent talent and engaging in ongoing training to ensure employees are capable of enacting change toward the CE (Susanty et al., 2020).
		Knowledge capability	The ability to develop or use intellectual capital, such as core competencies or strategic know-how, to move toward the CE (Scarpellini et al., 2020).
		Operational capability	The ability to generate CE outputs (e.g., CE products or services) through operational input (e.g., material, equipment, and information) in a coordinated and efficient manner (Ünal et al., 2019).
		Technological capability	The ability to develop and deploy appropriate scientific resources (e.g., material sorting system or new regenerative materials) for solving technical problems or enhancing functionality of products and operation processes related to the CE (Hinton, 2008).
Change related effort	The cooperative and championing behaviors to change toward the CE	Eco-design	An organization's practices to consider the environmental impacts and material flow of a product or service throughout its whole lifecycle from the very beginning stage of product design (Tyl et al., 2015). Examples include the selection of regenerative materials, circular production methods, and design for material longevity, multi-functionality and disassembly.
		Green sourcing	An organization's purchasing initiatives that aim to achieve circularity in sourcing (Rao & Holt, 2005). Examples include

			embedding environmental requirements in design specification for purchased items and/or cooperating with suppliers who have environmental management certifications.
		Cleaner production	An organization's practices related to improving resource and energy efficiency, as well as minimizing waste and environmental impacts during the product manufacturing process (Khalili et al., 2015). Examples include reusing spilt materials, adopting renewable energy, and/or avoiding the use of hazardous chemicals in production.
		Innovative business models	An organization's establishment of new methods to generate or sustain revenue by creating or capturing value within a value network, rather than the sale of disposable consumption goods in the traditional LE (Massa et al., 2017). Examples include provision of rental schemes or secondhand services.
		Waste management	An organization's practices to sort, disassemble, remanufacture, recycle, and recover waste or end-of-use resources in accordance with the principle of the CE (Osmani et al., 2006). Examples include selling defective products to recycling agents or using components of discarded products as materials in new products.
		Customer engagement	An organization's practices that aim to involve customers in the circle of the CE by increasing their participation in and connection with their company's CE activities (Vivek et al., 2012). Examples include product value proposition by providing take-back offers or maintenance services after sales.
Implementation effectiveness	The consistency and/or quality of change-related outcomes toward the CE	Environmental effects	The impact on the environment (e.g., reduced solid waste and greenhouse gas emissions) as an outcome of an organization's CE policies or practices (Rossi et al., 2020).
		Economic effects	The economic impact (e.g., cost reduction or increased income) as an outcome of an organization's CE policies or practices (Lipe, 2001).
		Social effects	The impact on society (e.g., mindset or cultural change) as an outcome of an organization's CE policies or practices (Rossi et al., 2020).

Table 2.
Examples of potential (original) scale items collected from literature

Construct	Dimension	Original scale item	Reference
Change commitment	Change valence	We have a clear vision of the CE and have aligned our corporate strategy accordingly	Kristoffersen et al. (2021)
		Do you agree that the principles of CE shall be considered as business ethics?	Liu and Bai (2014)
	Engagement intent	Our employees are totally involved and committed to lean manufacturing practices	Agyabeng-Mensah et al. (2021)
		Willingness to accept suggestions from the workers to improve the implementation of reuse, recycle, and remanufacture in the process of managing wood waste	Susanty et al. (2020)
Change efficacy	Financial capability	Percentage of total revenues invested in renewables	Aranda-Usón et al. (2019)
		Monetary value of the financial resources invested to change the business model, from strategic and management action to capacity building operational and maintenance	Rossi et al. (2020)
	Human resource capability	Special training on knowledge and skills in managing wood waste	Susanty et al. (2020)
		Our firm has recycling training programs for employees	Schmidt et al. (2021)
	Knowledge capability	Study the material and energy flows and their application	Saavedra et al. (2018)
		The company has integrated the C2C standards in procedures and work instructions	Drabe and Herstatt (2016)
	Operational capability	Our firm communicates information about the recyclability of our products across all business functions	Schmidt et al. (2021)
		We hold periodic meetings to inform all the employees about the latest innovations in the company	Agyabeng-Mensah et al. (2021)
	Technological capability	The development of new technologies that optimize resource efficiency and safety	Hinton (2008)
		Introduce new environmental technology	Cheng et al. (2022)

Change-related effort	Eco-design	Design of products for reduced consumption of material/energy	Zhu et al. (2010)
		Establish rules on product design (e.g., minimum requirements on 'durability' under Ecodesign Directive, 2009/125/EC)	de Arroyabe et al. (2021)
	Green sourcing	Provide design specification to suppliers that include environmental requirements for purchased items	Zhu et al. (2010)
		The company has obliged its supply base to supply according to C2C standards	Drabe and Herstatt (2016)
	Cleaner production	We run a lean and clean production (e.g., use less energy and materials, treat wastes, rework)	Kristoffersen et al. (2021)
		Percentage of processes or operating procedures that have been replaced and/or improved to reduce energy consumption or to exploit renewables	Aranda-Usón et al. (2019)
	Innovative business models	Innovative business models for the circular economy (e.g., leasing and sharing)	de Arroyabe et al. (2021)
		Are companies moving to CE revenue models based on providing a service rather than offering a product?	Potting et al. (2017)
	Waste management	Collect and recycle end-of-life products and materials	Zhu et al. (2010)
		Use discarded product or its parts in a new product with a different function	Potting et al. (2017)
	Customer engagement	Education of consumers to reduce product waste	Lüdeke-Freund et al. (2019)
		Promote sustainable consumption habits through campaigns, awareness and educational programs	Jurgilevich et al. (2016)
Implementation effectiveness	Environmental effects	Increased efficient use of natural resources	Jabbour et al. (2020)
		Total weight of waste diverted from disposal	Franco et al. (2021)
	Economic effects	Improved profitability	Jabbour et al. (2020)
		Decrease of fee for waste discharge	Zhu et al. (2012)
	Social effects	Creation of employment	Kristensen and Mosgaard (2020)
		Improved public health by reducing solid and hazardous waste	Ghisellini et al. (2016)

Table 3.
Item distribution in step 1 and step 2

Item bank	Dimension	Phase 1				Phase 2	
		Initial item bank		Items after binning and winnowing		Items after content expert validation	
		NO.	Total	NO.	Total	NO.	Total
Change commitment	Change valence toward the CE	25	43	6	11	6	11
	Engagement intent toward the CE	18		5		5	
Change efficacy	Financial capability	14	227	4	22	6	22
	Human resource capability	30		5		4	
	Knowledge capability	43		4		3	
	Operational capability	100		5		5	
	Technological capability	40		4		4	
Change-related effort	Eco-design	68	267	6	26	6	25
	Green sourcing	34		5		5	
	Cleaner production	40		6		6	
	Innovative business models	21		2		2	
	Waste management	58		4		3	
	Customer engagement	46		3		3	
Implementation effectiveness	Environmental effects	52	109	7	17	6	14
	Economic effects	42		6		4	
	Social effects	15		4		4	
			646		76		72

Table 4.
Sample description of content expert validation (n=9)

No.	Firm name	Firm type	Firm size	Job position	Working experience
1	361 Sports Wear	Fashion Apparel Firm	Large-sized	Merchandise Manager	9 years
2	Bestseller	Fashion Apparel Firm	Large-sized	Buyer Manager	13 years
3	Rainbow Womens Wear	Fashion Apparel Firm	Middle-sized	PD Manager	10 years
4	Aimer Underwear	Fashion Apparel Firm	Large-sized	Senior Marketing Manager	12 years
5	Lushi Fashion Wear	Fashion Apparel Firm	Small-sized	Owner	6 years
6	Wanfang Fashion Wear	Fashion Apparel Firm	Micro-sized	Owner	4 years
7	Dongfangqili Fashion Co.	Fashion Apparel Firm	Large-sized	Store Manager	7 years
8	Leyou Kids Wear	Fashion Apparel Firm	Large-sized	Marketing Director	17 years
9	Sanfu Textile	Textile Firm	Large-sized	Supply Chain Manager	21 years

Table 5.
Sample description of cognitive interview (n=10)

No.	Firm name	Firm type	Firm size	Job position	Working experience
1	Aimer Underwear	Fashion Apparel Firm	Large-sized	Public Relations Manager	9 years
2	Nanshan Group	Textile Firm	Large-sized	PD Manager	11 years
3	DiShang Group	Textile Firm	Large-sized	Vice General Manager	15 years
4	Dongfangqili Fashion Co.	Fashion Apparel Firm	Large-sized	Merchandising Manager	6 years
5	Meier Fashion Wear	Fashion Apparel Firm	Middle-sized	General Manager	23 years
6	Furongfang Fashion Co.	Fashion Apparel Firm	Small-sized	Marketing Director	7 years
7	Vicutu Men's Wear	Fashion Apparel Firm	Middle-sized	PD Manager	14 years
8	Lutai Textile	Textile Firm	Large-sized	Marketing Manager	12 years
9	Rosemoo Wear	Fashion Apparel Firm	Middle-sized	Store Manager	9 years
10	Lai Studio	Fashion Apparel Firm	Micro-sized	General Manager	3 years

Table 6.
Sample description of psychometric evaluation (n=500)

Variable	Category	Frequency	Percentage
Age	21-30	56	11.2%
	31-40	262	52.4%
	41-50	142	28.4%
	51-60	40	8%
	Total	500	100%
Gender	Male	259	51.8%
	Female	241	48.2%
	Total	500	100%
Firm type	Textile firm	292	41.4%
	Apparel firm	207	58.4%
	Others	1	0.2%
	Total	500	100%
Firm size	Micro-sized firm	27	5.4%
	Small-sized firm	270	54%
	Middle-sized firm	180	36%
	Large-sized firm	23	4.6%
	Total	500	100%

Note. Firm type was categorized based on its primary business. According to China's National Bureau of Statistics (2011), a micro-sized fashion firm has less than 20\10 employees and/or 3\1 million RMB annual revenue (manufacturing or retailing based); a small-sized firm has 20-300\10-50 employees and/or annual revenue of 3-20\1-5 million RMB (manufacturing or retailing based); a middle-sized firm has 300-1000\50-300 employees and/or annual revenue of 20-400\5-200 million RMB (manufacturing or retailing based); and a large-sized firm has more than 1000\300 employees and/or annual revenue of more than 400\200 million RMB (manufacturing or retailing based).

Table 7.
Item parameter estimates and item fit statistics for the final scales

Scale	Dimension	Item (English/Chinese)	a	S_X²	df	p	M_2	α
Change commitment toward the CE	Change valence	The firm is committed to implementing a change toward the CE. 公司承诺全心投入实现向循环经济的转变	.72	13.72	11	.25	M2(5) = 2.63 RMSEA2 = .04 SRMR = .03 CFI = .99 TLI = .99	.71
		The firm is motivated to implement the principles of the CE into our new business ethics. 公司乐于将循环经济的原则纳入公司的商业道德规范	.93	9.54	10	.48		
		The firm is committed to reducing the consumption of natural resources and materials. 公司承诺减少自然资源和材料的消耗	.91	9.75	11	.55		
	Engagement intent	The firm has the willingness to recycle waste. 公司有意循环回收废弃物	.97	12.90	10	.23		
		The firm has the willingness to minimize waste production. 公司有意减少废弃物的产生	1.03	8.21	11	.69		
		The firm has the willingness to improve the implementation of reuse and remanufacture in the process of managing textile waste. 公司有意在处理纺织废弃物時实施再利用和再制造	.83	16.00	10	.10		
Change efficacy toward the CE	Financial capability	The firm has the financial capability to train employees to practice the CE. 公司有财务能力去培训员工，以开展循环经济实践	.75	20.10	12	.07	M2(4) = 3.63 RMSEA2 = .06 SRMR = .02 CFI = .99 TLI = .97	.83
	Human resource capability	The firm is capable of offering our employees special training on knowledge and skills about the CE. 公司有能力为员工提供与循环经济有关的知识和技能的专门训练	.88	12.87	12	.38		
	Knowledge capability	The firm has the environmental compliance and auditing programs to implement the CE. 公司为了实施循环经济，会有相应的环境合规与审查程序	.90	15.29	12	.23		

		The firm has the capability to study the material and energy flows and their application. 公司有能力去学习材料和能源的流转与应用	1.19	18.92	12	.09		
	Technological capability	The firm has technological skills for implementing the change toward the CE. 公司具备向循环经济转变的技术能力	.76	9.60	12	.65		
		The firm has technologies that can optimize resource efficiency and safety. 公司具有优化资源使用效率和安全的新技术	.91	11.34	11	.41		
Change-related effort toward the CE	Eco-design	The firm strives to implement the CE by designing products and/or services for low waste. 公司致力于通过产品设计和/或服务来减少废弃物排放	.99	17.52	15	.29	M2(5) = 4.61 RMSEA2 = .06 SRMR = .03 CFI = .98 TLI = .99	.82
		The firm strives to implement the CE by designing products and/or services for longevity (e.g., by creating clothing with longevity in mind and keeping clothing in use as long as possible). 公司致力于设计更持久的产品和/或服务（如在设计服装时关注产品的使用寿命，尽可能延长产品的服务时间）	1.00	22.95	15	.09		
	Green sourcing	The firm strives to implement the CE by mentoring suppliers to improve their CE performance. 公司致力于对供应商进行指导，以提高他们在循环经济上的表现	.79	21.29	15	.13		
	Cleaner production	The firm strives to implement the CE by replacing materials used in the production processes with less toxic, renewable, recyclable, and biodegradable materials. 公司致力于在生产过程中将原材料替换成毒性更小、可再生、可循环再用或可生物降解的材料	.88	9.24	15	.87		
	Innovative business models	The firm strives to implement the CE by adopting/providing new business models (e.g., leasing/rental schemes or second-hand services). 公司致力于采用/提供新的商业模式（如租赁计划或二手服务）来实践循环经济	1.13	27.09	17	.06		
	Waste management	The firm strives to implement the CE by providing activities/programs for extending the lifespan of materials.	.83	15.88	15	.39		

		公司致力于通过提供活动/项目去延长产品和材料的使用时长						
	Customer engagement	The firm strives to implement the CE by educating customers about how to take care of the products in order to extend product life or reduce waste. 公司致力于指导顾客如何透过保养产品延长其使用寿命或减少废弃物产生	1.02	18.27	15	.25		
Implementation effectiveness toward the CE	Environmental effects	The firm's implementation of the change toward the CE was effective in increasing resource efficiency. 公司对循环经济的实施有效地提高了资源使用效率	1.12	18.04	12	.12	M2(4) = 4.76 RMSEA2 = .07 SRMR = .03 CFI = .91 TLI = .97	.75
		The firm's implementation of the change toward the CE was effective in decreasing the consumption of virgin materials. 公司对循环经济的实施有效地减少了原生材料的消耗	1.01	20.22	12	.06		
		The firm's implementation of the change toward the CE was effective in enhancing recycling rates after use. 公司对循环经济的实施有效地提高了（废旧产品或废弃物的）回收率或再利用率	.89	14.20	16	.58		
	Economic effects	The firm's implementation of the change toward the CE was effective in increasing accessibility to new markets. 公司对循环经济的实施有效地协助公司进入新市场	.67	14.80	12	.25		
		The firm's implementation of the change toward the CE was effective in improving profitability. 公司对循环经济的实施有效地提高了盈利	.68	21.83	12	.06		
		The firm's implementation of the change toward the CE was effective in gaining new revenue. 公司对循环经济的实施有效地赚取到新的收入	.68	10.92	15	.76		

Table 8.

Policy implications related to FashionReady4CE scales

Key actions	Specific implications
Monitoring and evaluation	Utilizing the FashionReady4CE scales, Chinese policymakers and regulatory bodies can institute operational frameworks to monitor and assess the current status and progression of Chinese fashion organizations' transition toward the CE. Through regular assessments facilitated by our scale, they can gain valuable insights into the effectiveness of the CE initiatives they have imposed on fashion organizations. Furthermore, based on the assessment results, they can promptly and effectively identify and implement the necessary policy adjustments.
Targeted initiatives	Chinese policymakers and regulatory bodies can leverage our scale to evaluate fashion organizations and classify them into distinct groups based on their scores across the change readiness, change-related efforts, and implementation effectiveness scales. This segmentation will empower policymakers to formulate customized CE initiatives that address the specific levels of engagement, needs, capabilities, and challenges within each group.
Resource allocation	The monitoring, evaluation, and segmentation of fashion organizations facilitated by the FashionReady4CE scales will further enable policymakers to strategically allocate their limited resources and funding, prioritizing those organizations that genuinely need assistance in enhancing their change commitment and change efficacy, specifically focusing on their change readiness. This could involve implementing initiatives like offering grants or establishing partnerships with relevant industry stakeholders.
Recognition and incentives	Utilizing the FashionReady4CE scales will also enable policymakers to identify fashion organizations that are demonstrating significant progress in their CE journey and to recognize and provide financial incentives to these organizations. Publicly acknowledging the commitment of these organizations and showcasing them as fashion industry role models could serve as motivation for other organizations to emulate their change related efforts.
The policy actions mentioned above, facilitated by the FashionReady4CE scales we have created, will empower policymakers to provide practical and tangible support, enabling Chinese fashion organizations to transition successfully from the LE to the CE. This will not only contribute to a more sustainable fashion industry, but also strengthen the nation's position as a leader in circular fashion practices, yielding positive impacts on the economy, society, and environment.	

Figure 1.

Summary of the item development process

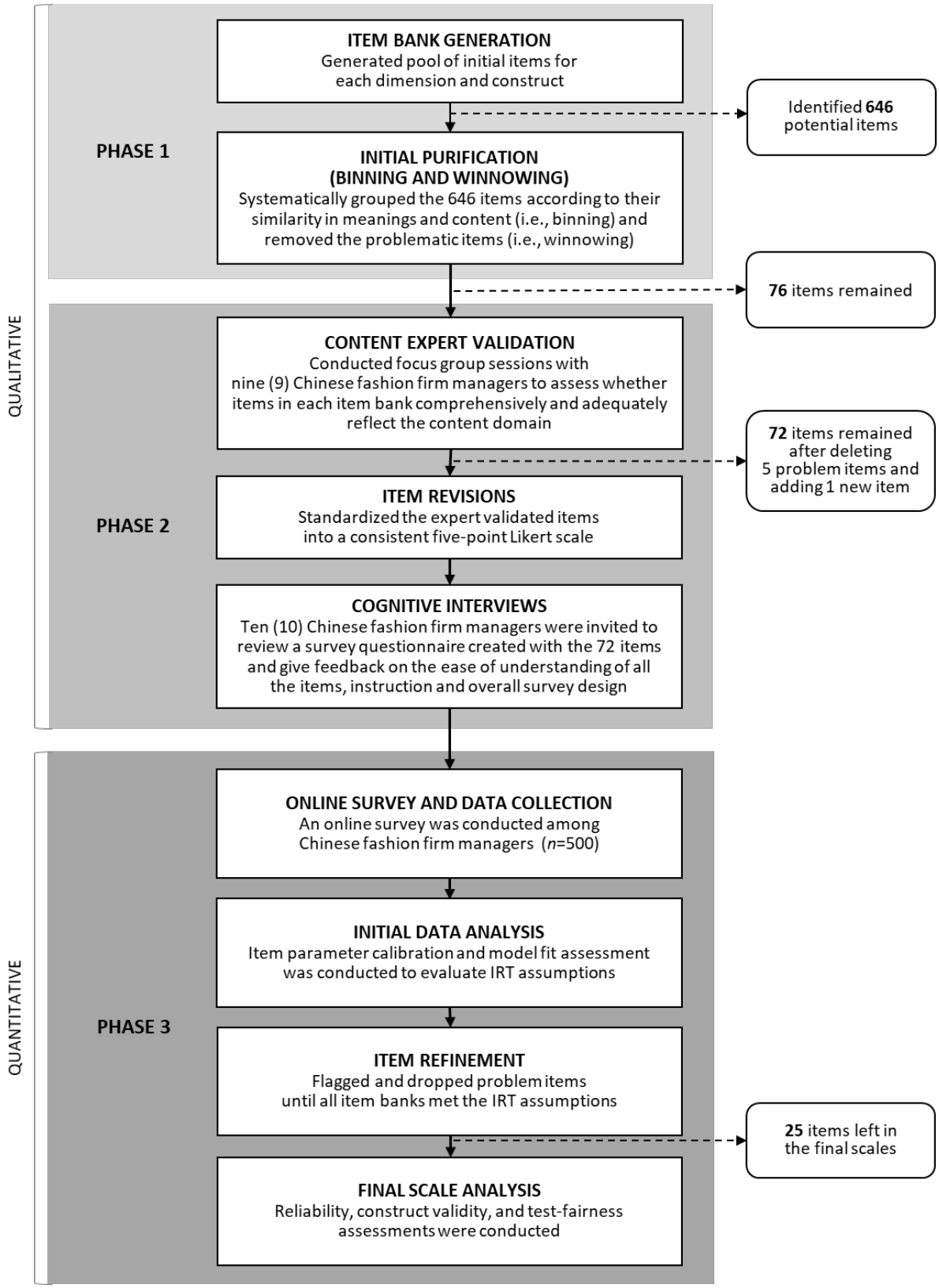
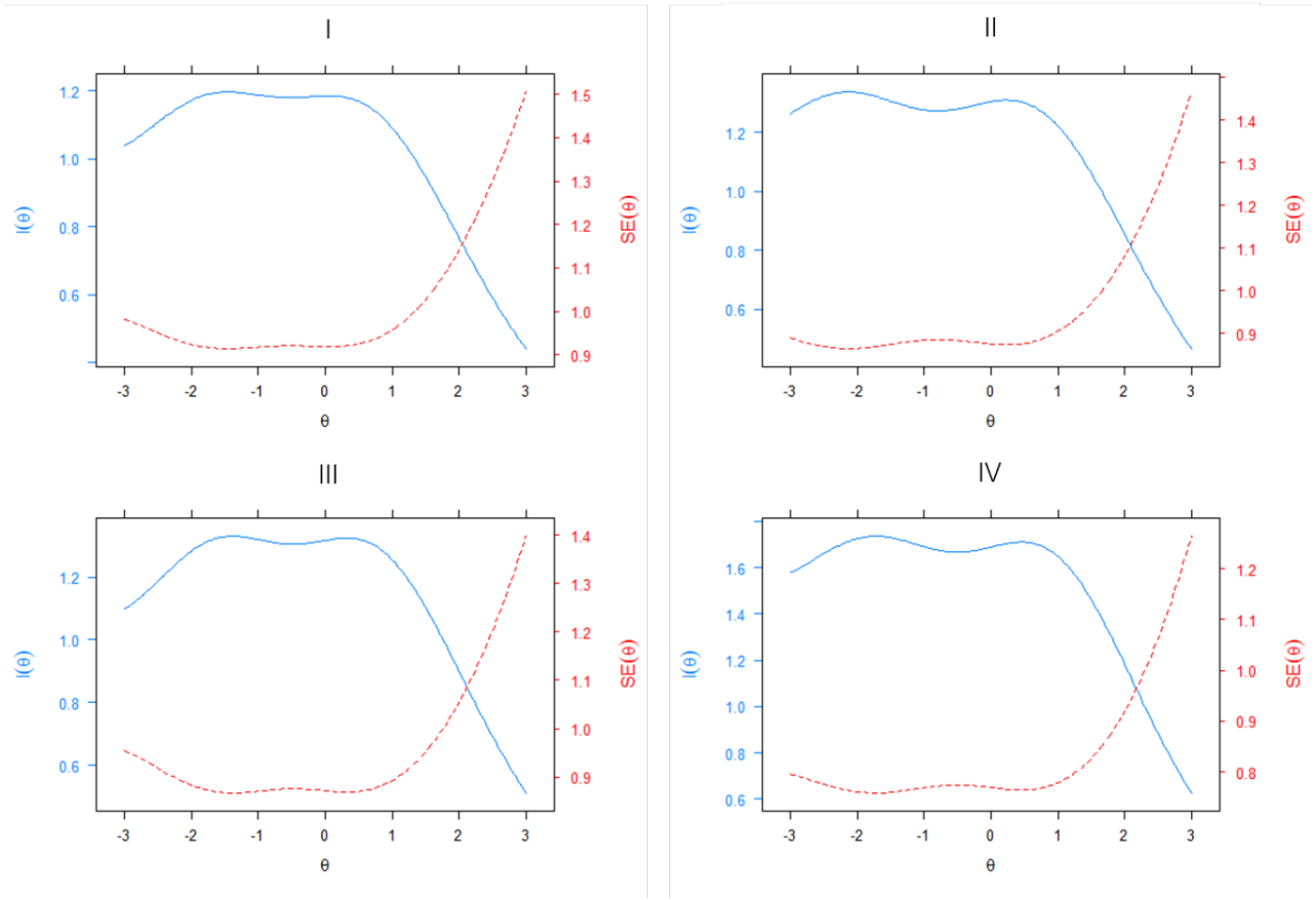


Figure 2.
Item information function of the scales



Note. Figure I represents the scale of change commitment; figure II represents the scale of change efficacy; figure III represents the scale of change-related effort; figure IV represents the scale of implementation effectiveness.

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