Textile & Leather Review

ISSN 2623-6281 | www.tlr-journal.com | 10.31881/TLR

Live E-commerce Marketing Strategy for Chemical Fibre Enterprises Based on 4R Theory

Zhaojin Zhang

How to cite: Zhang Z. Live E-commerce Marketing Strategy for Chemical Fibre Enterprises Based on 4R Theory. Textile & Leather Review. 2025; 8:508-538.
https://doi.org/10.31881/TLR.2025.025

How to link: https://doi.org/10.31881/TLR.2025.025

Published: 31 July 2025

Live E-commerce Marketing Strategy for Chemical Fibre Enterprises Based on 4R Theory

Zhaojin ZHANG

Weinan Normal University, Weinan 714000, Shaanxi, China
cttfow463@163.com

Article
https://doi.org/10.31881/TLR.2025.025
Received 12 June 2025; Accepted 17 July 2025; Published 31 July 2025

ABSTRACT

With the rapid rise of live e-commerce, there is a significant lack of systematic marketing strategies for chemical fibres in this environment. This study fills this gap by constructing a 4R theory-based live e-commerce marketing framework for chemical fibre companies and explores each dimension's impact on marketing effectiveness, offering theoretical and practical guidance. This study adopts a mixed research method, combining theoretical modelling, case analysis, and empirical research. Two representative chemical fibre companies were selected for case studies to analyse their live e-commerce marketing practices in depth. Meanwhile, 450 questionnaires were distributed, and 402 valid questionnaires were recovered, and the data were quantitatively analysed using structural equation modelling (SEM) to validate the hypothesised relationships between the dimensions of the 4R theory and the marketing performance indicators. The results of the study show that relevance significantly enhances customer conversion rate, responsiveness effectively enhances customer satisfaction, relationality significantly promotes customers' willingness to repurchase, and rewarding effectively improves marketing return on investment (ROI). In addition, empirical analysis shows that Company A, which implements a comprehensive 4R strategy, outperforms Company B, which does not fully implement a 4R strategy, in key indicators such as customer interaction rate, repurchase intention, and ROI tracking. The present study reveals the significant applicability of the 4R theory in live e-commerce marketing in the chemical fibre industry. Theoretically, this study expands the application of 4R theory in industrial live streaming. Practically, it provides specific marketing strategy paths for chemical fibre enterprises to enhance brand communication and market expansion. Future research can further expand the sample scope to include more different types of enterprises and explore the application potential of 4R theory in other emerging marketing channels, to continuously improve and deepen the theory and practice in this field.

KEYWORDS

4R theory, chemical fibre companies, live E-commerce, marketing strategy, relationship marketing

INTRODUCTION

In recent years, with the development of Internet technology and the continuous evolution of the consumption model, live E-commerce as a new marketing channel has risen rapidly and has become an important means for enterprises in various industries to develop the market and improve sales [1,2]. Especially in the textile and chemical fibre industry, the traditional sales channels are facing the pressure of transformation and upgrading, and enterprises urgently need to achieve the dual goals of

brand communication and market expansion through digital means [3]. Live E-commerce with its strong interactivity, high conversion rate, low communication costs, and other characteristics, for chemical fibre enterprises to provide new development opportunities [4]. As intermediate raw materials facing downstream markets, chemical fibres encounter information barriers and cognitive difficulties. Effectively communicating product value and reaching target customers via live e-commerce remains a key challenge for their digital transformation [5]. The traditional product-centric marketing model has made it difficult to meet the diversified and personalised needs of consumers, and enterprises must make strategic adjustments with more user-oriented thinking [6]. Among many marketing theories, the 4R theory (i.e., Relevance, Response, Relation, Return) provides theoretical support for enterprises to optimise their live E-commerce strategies with its distinctive customer-oriented perspective and high adaptability to the digital marketing environment [7]. The 4R theory, proposed by Don E. Schultz, focuses on customer interaction and long-term relationship building, promoting value creation in digital marketing [8,9]. The 4R theory is well-suited to chemical fibre live e-commerce. As intermediaries targeting business customers [10], the "Relevance" strategy showcases product-need fit. "Response" leverages live interaction to address inquiries promptly, building satisfaction and trust. "Relationship" fosters loyalty and repeat business [11,12], while "Return" enables ROI quantification and optimisation. In conclusion, the 4R theory provides systematic theoretical support for the marketing practice of chemical fibre enterprises in live e-commerce, and helps enterprises to realize the brand value and economic benefits [13]. The 4R theory emphasizes customer needs, long-term interactive relationships, and direct feedback, guiding chemical fibre enterprises to build a systematic marketing system in live e-commerce [14,15]. Despite the advantages of 4R theory in customer relationship marketing, some studies have pointed out the problems that may exist in its practical application, for example, 4R theory requires a strength base or certain special conditions when establishing customer associations and relationships, which is not something that any enterprise can do easily; in addition, the theory is poor in practical operability, which on the one hand introduces more uncontrolled variables, and on the other hand, it lacks implementation tools, enterprises may feel clueless when applying it in practice. This study will further improve and deepen the application of the theory through the practical exploration of the theory in the live e-commerce environment [16]. Based on this, this paper takes the 4R theory as the analytical framework, focuses on the live E-commerce marketing practice of chemical fibre enterprises, and aims to explore how chemical fibre enterprises can enhance the marketing effect of live E-commerce through the organic integration of relevance, responsiveness, relationship and return, enhance customer stickiness, and ultimately realize the double enhancement of brand value and economic benefits under the current market environment. Through the systematic combination of related theories and empirical analysis, this paper hopes to provide operable strategic references for the digital transformation of the chemical

fibre industry, and at the same time, to enrich the practical cases of the application of the 4R theory in emerging marketing channels.

This study innovatively applies the 4R theory to the field of live e-commerce in the chemical fibre industry. Compared with the traditional marketing theory, it emphasises more on customer-centeredness, focusing on the establishment of long-term interactive relationships as well as the direct feedback and long-term return of the marketing activities in the industrial B2B scenarios, which provides new perspectives and ideas for the industrial B2B marketing framework, and enriches the existing marketing theory system. The contribution of this study is significant. On the theoretical level, the 4R theory is introduced into the field of live e-commerce in the chemical fibre industry, expanding the boundaries of the application of relationship marketing theory in the industrial live broadcasting scenario, and enriching the research on the application of the 4R theory in emerging marketing channels. Practically, it provides actionable strategic suggestions for the digital marketing transformation of chemical fibre enterprises [17]. This study will focus on the following core issues: How to construct a 4R strategy model for live-streaming e-commerce applicable to the chemical fibre industry? How to quantify the impact of each dimension on marketing effectiveness? To this end, we will systematically review the current application of live-streaming e-commerce in the industrial sector and the development of the 4R theory, and clarify the theoretical framework's applicability.

This paper is structured into five main sections. Following the introduction, the 2nd section presents a literature review on the 4R theory and live E-commerce, identifying research gaps and laying the theoretical foundation. The 3rd section outlines the research methodology, including model construction, case study design, and questionnaire development. The 4th section provides empirical results and a comparative analysis of two typical chemical fibre enterprises using structural equation modelling. Finally, the 5th section concludes the study, summarising key findings, discussing strategic implications, and suggesting future research directions.

SYNTHESIS OF RESEARCH

Building on the challenges faced by the chemical fibre industry in live-streaming marketing as outlined in the introduction, this section lays the groundwork for the study from three perspectives: (1) the development characteristics of live-streaming e-commerce in the industrial sector, (2) empirical evidence of marketing pain points in chemical fibre enterprises, and (3) the essence of the 4R theory and its applicability in B2B scenarios.

Development and Application Status of Direct Broadcast E-commerce

As a new business model integrating "content+social+transaction", live E-commerce has been developing rapidly in China since 2016 and has penetrated various industries in a short period [18,19].

According to the data released by China Internet Network Information Centre (CNNIC), by the end of 2024, the scale of the national network live broadcasting users has exceeded 800 million, of which the proportion of live E-commerce users is nearly 70% [20]. Live E-commerce has not only changed the way consumers shop but also reshaped the marketing logic of enterprises, shifting from traditional push communication to pull interaction centred on user experience [21].

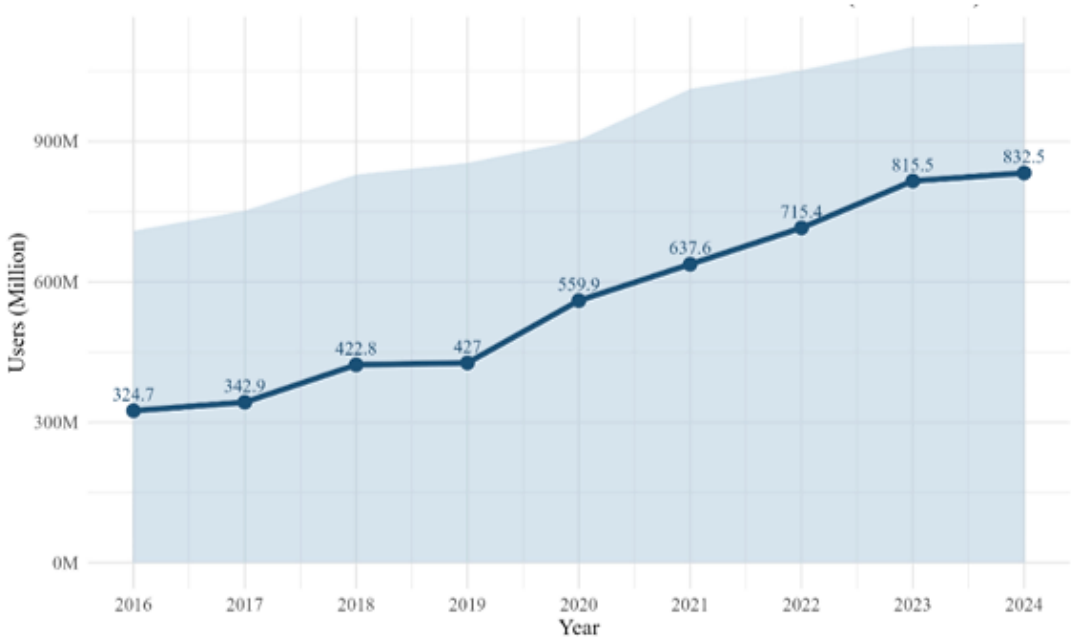

Figure 1. The trend of China's live E-commerce user growth in 2016-2024 (Data collected by the authors)

Figure 1 shows the growth trend of live E-commerce users in China from 2016 to 2024. The shaded part of the figure indicates the overall number of Internet users in that year. It can be seen that the number of E-commerce users is generally showing an upward trend, although the growth rate has slowed down in some periods, while the growth trend of the overall number of users is similar to that of E-commerce users, which both show stable growth.

Although later adopters, chemical fibre enterprises increasingly utilise live e-commerce. Integrating B2B and B2C approaches, they leverage live streaming's visual product display and real-time interaction to enhance conversion rates and brand impact [22,23]. However, compared with FMCG, clothing, and other end consumer goods industries, chemical fibre enterprises in the live E-commerce operation are still facing unique challenges such as high content specialisation, customer group dispersion, complex marketing logic, etc., and urgently need systematic strategic guidance.

Marketing Characteristics and Challenges of Chemical Fibre Enterprises

As upstream raw materials with complex specifications and applications, chemical fibres demand highly professional and accurate live content [24,25]. In addition, the target customers are mainly corporate purchasing and processing manufacturers, with a long purchasing decision cycle, a large single transaction amount, and strong customer stickiness, so chemical fibre enterprises can not rely solely on the short-term promotional drive in live broadcast marketing but need to focus on long-term relationship building and brand value transfer [26,27]. The current chemical fibre enterprises in live E-commerce marketing generally have the following problems, as shown in Table 1.

Table 1. Summary Table of Frequently Asked Questions about Live E-commerce for Chemical Fibre Companies

NO.	Key points	Supportive Interview Content	Data/ratio*	note
1	Homogenization of live content, lack of differentiated competitiveness	"We watched our peers live and spoke about pretty much the same thing with little noticeable difference." (Interviewee A)	73% of companies surveyed believe that their peers' live content is duplicative	Sourced from qualitative interviews and questionnaire statistics
2	Product explanations emphasise technical parameters and ignore application scenarios	"Parameters are too much to talk about; customers simply can't remember, they are more concerned about how to use it and what process it is suitable for." (Interviewee C)	65% of live product introductions do not show typical use cases	Sourced from live replay analysis
3	Weak customer relationship management system	"Customers ask and leave, rarely repurchase, and we don't have a system to record their needs." (Interviewee E)	58% of organisations do not have a live customer CRM record-keeping mechanism in place	Questionnaire recovery data
4	Lack of an input-output evaluation system	"We spent money to invest in live streaming, but we don't know how much we made." (Interviewee F)	61% of companies have not set live ROI assessment metrics	Derived from interviews and questionnaire summaries
5	Long customer decision-making cycles and specific requirements for content pacing	"Enterprise customers often require multiple communications, and they don't place orders in seconds like C-suite users." (Interviewee G)	About 78% of B-side customers need to experience >3 times of communication before generating a purchase intention.	Data from a small sample of interviews

*Note: Data collected by authors

The current chemical fibre enterprises in live E-commerce marketing generally face several key challenges. First, there is a high degree of homogenization in live content, which has become a common pain point. Most companies cannot effectively distinguish their products from competitors, as evidenced by 73% of the surveyed companies pointing out that "the peer live content is highly repetitive" (Interviewee A). This lack of differentiation makes it difficult for enterprises to stand out in the market. Second, in the way products are displayed, enterprises rely too much on the stack of technical parameters, ignoring the explanation and demonstration for the actual application scenarios. 65% of the enterprise's live content lacks typical application cases (Interviewee C). Customers are more concerned about how the product can be used rather than just the technical specifications. Third, most enterprises have not yet built a systematic customer relationship management mechanism, resulting in high customer turnover and a lack of a long-term maintenance path. Relevant data show that 58% of enterprises have not established customer CRM records [28,29]. This lack of a CRM system makes it difficult to track and manage customer interactions effectively. Fourth, in terms of resource investment and return management, enterprises generally lack an effective evaluation system. 61% of enterprises said that they have not yet set up live ROI assessment indicators, resulting in marketing activities "spending money but difficult to assess the effect" (Interviewee F). Without clear ROI metrics, it is challenging to optimise marketing strategies. Finally, the B-end transaction for enterprise customers has delayed decision-making characteristics. About 78% of customers need to experience more than 3 times of communication before they can form a purchase intention (Interviewee G). This long decision-making cycle requires a well-organised approach to content pacing and information delivery.

In summary, these challenges highlight the need for a more strategic and customer-centric approach to live E-commerce marketing in the chemical fibre industry. Enterprises must focus on creating differentiated content, improving customer interaction, building robust CRM systems, and establishing clear ROI metrics to enhance their market competitiveness and achieve sustainable growth.

Connotations of 4R Theory and Application

The 4R theory was proposed by American marketing expert Don E. Schultz as an optimisation and supplement to the traditional 4P marketing theory (product, price, channel, promotion). The 4R theory emphasises customer-centeredness and re-examines the marketing activities from the four dimensions of Relevance, Response, Relationship, and Return, respectively (as seen in Figure 2).

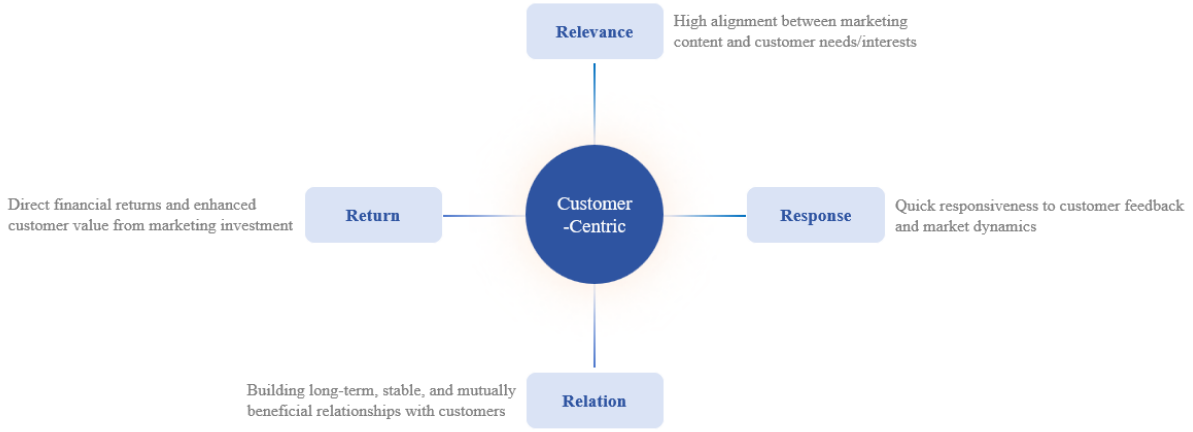

Figure 2. The core framework of the 4R theory

In the live E-commerce environment, the 4R theory can effectively guide chemical fibre enterprises to accurately identify customer needs, flexibly adjust content strategy, strengthen customer interaction and maintenance, and optimise the input-output ratio through data analysis to form a virtuous cycle.

Current Status of Related Research in China and Abroad

At present, domestic and international research on live e-commerce mainly focuses on consumer behaviour analysis (such as impulsive buying, trust mechanism), anchor influence research (such as KOL traits, fan economy), and platform algorithm mechanism optimisation. Some scholars have begun to pay attention to the application of live broadcasting in the field of B2B, exploring its potential in industrial marketing, but the research mostly focuses on the description of the phenomenon and feasibility analysis, and lacks the construction of a systematic strategy framework. In particular, for chemical fibre enterprises, a typical midstream and upstream manufacturing industry, the research on their live broadcast e-commerce strategy is still relatively scarce [30,31]. Most of the existing literature follows the traditional 4P theory, STP theory, or SOSTAC model when analysing the marketing of B2B enterprises. However, these models have limitations in guiding live e-commerce, a strongly interactive and relationship-heavy scenario: the 4P theory is product-centered, which makes it difficult to fully reflect the value of real-time interactions with customers in live broadcasting; the STP theory focuses on market positioning, but provides insufficient guidance on the subsequent process of customer relationship maintenance [32,33]. Therefore, academics and industry are in urgent need of a theoretical framework that better reflects the dynamic development of customer relationships and the value co-creation process.

Research Review and Selection of Theoretical Framework

Among many marketing theories, customer-centred relationship marketing theory provides a new perspective to solve the above problems. Among them, the 4R theory (Relevance, Response, Relation, Return) proposed by Don E. Schultz et al. is particularly prominent. Unlike the 4P theory, which emphasises the "push" action of the enterprise, the 4R theory emphasises, from the perspective of the customer, focusing on the "relevance" of the customer, the "response" to customer needs, the "relationship" with the customer, and the "relationship" established with the customer. The 4R theory emphasises the "connection" with the customer, the "response" to the customer's needs, the "relationship" with the customer, and the two-way "return" for both the customer and the company from the customer's point of view. The 4R theory is chosen as the core analytical framework of this study based on the following three considerations:

(1) High scenario suitability. The core features of live e-commerce are "instant interaction" and "relationship building", which are highly compatible with the "reactive" and "relational" dimensions of the 4R theory. This is highly compatible with the "reactive" and "relational" dimensions of the 4R theory. Live broadcast is no longer a one-way product information instillation, but a two-way communication between the enterprise and potential customers, to establish trust in the field.

(2) Fit the essence of B2B marketing. Chemical fibre industry, as a B2B industry, the customer decision-making cycle is long, with high unit price, and focuses on long-term cooperation. 4R theory emphasises the establishment of a long-term solid "relationship" through continuous interaction, and ultimately realises the comprehensive "return", including customer loyalty, life cycle value. "This is completely consistent with the goal of B2B marketing to pursue long-term value.

(3) Make up for the lack of existing research. The current empirical research on the in-depth combination of 4R theory and live e-commerce of B2B enterprises is still insufficient. This paper applies the 4R theory to the chemical fibre industry, which can not only test the effectiveness of the theory in the emerging digital channel but also provide a verified and operable strategy model for the digital transformation of the same type of manufacturing enterprises. Therefore, this paper takes the 4R theory as a pivot point to systematically explore the live e-commerce marketing strategy of chemical fibre enterprises, aiming at enriching the application of relationship marketing theory in digital scenarios and providing theoretical guidance for the practice of midstream and upstream manufacturing enterprises.

METHODOLOGY

This study adopts a mixed method of theoretical modelling, case exploration, and quantitative verification to refine dimension indicators, verify strategy effectiveness, and test path relationships.

Research Design and Data Triangulation Mutual Verification

To ensure the scientific validity and credibility of the research findings, this study adopts a hybrid research method combining "theory construction - qualitative exploration - quantitative verification". The design enhances the validity of the study through Data Triangulation. The specific path is shown in the figure:

(1) Theoretical model construction. Based on the 4R theory and the characteristics of the chemical fibre industry, the initial theoretical model of live e-commerce marketing strategy and research hypotheses is constructed.

(2) Case study (qualitative). Through in-depth interviews and observations, an in-depth analysis of the specific practices of typical enterprises, to provide rich real-world situations and details to support the theoretical model, and to amend and optimise the questionnaire items.

(3) Questionnaire survey and SEM analysis (quantitative). Through large sample data, the preliminary laws found in the case study are statistically tested to verify the universality of the theoretical model and the significance of each path.

Through this design, the depth of insight from the case study and the breadth of verification from the questionnaire survey complement each other and together point to a more robust research conclusion. The methodological path of this study is schematized in Figure 3.

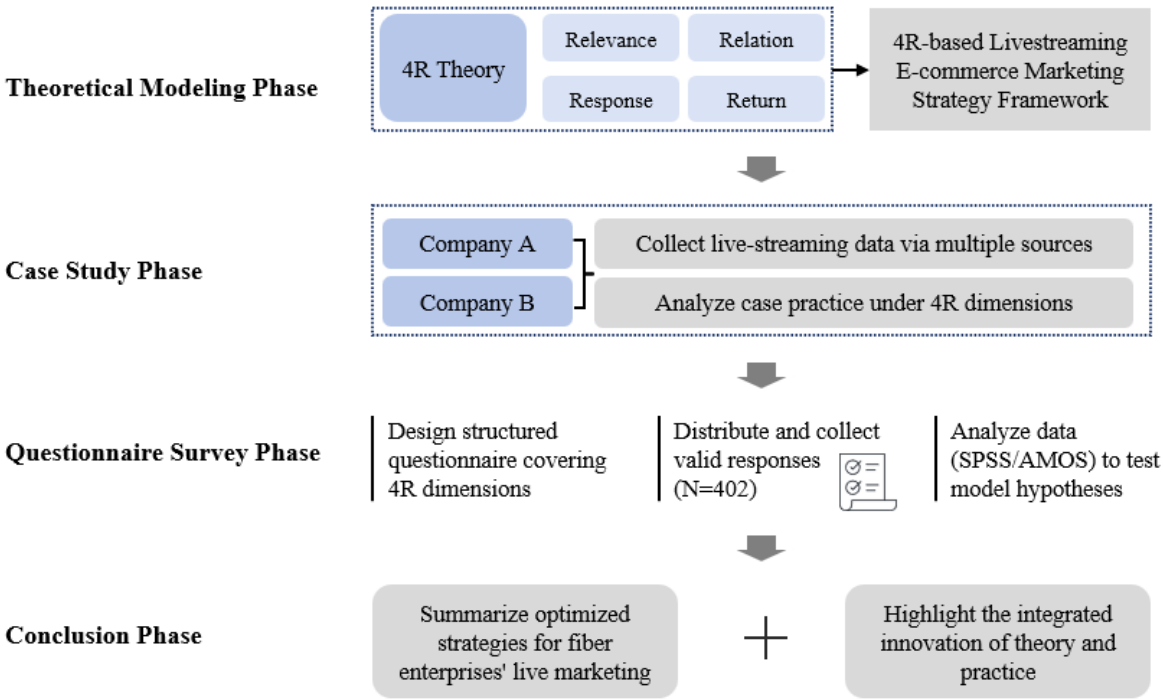

Figure 3. Flowchart of the design framework for this study

Theoretical Modelling

Based on the definition of the core elements of the 4R theory in the previous overview section, this paper firstly starts from the actual needs of live E-commerce of chemical fibre enterprises and carries out targeted refinement of the four dimensions of the 4R theory to form a specific measurement index system adapted to the live E-commerce situation:

(1) Relevance: whether the live content is closely related to the actual application needs of the target customers, including the degree of coverage of product application case sharing, industry pain point solutions, and other content;

(2) Reactivity (Response): the enterprise in the live process of customer inquiries, feedback on the immediate response speed and depth of treatment, including the rate of live answers, after-sales response mechanism settings;

(3) Relationship (Relation): through the life before, during, and after the customer relationship maintenance measures, such as regular return visits, customer hierarchical management, exclusive service customisation, and so on, the degree of perfection.

(4) Return: the actual sales conversion rate, customer repurchase rate, and customer life cycle value changes brought about by the live broadcast.

Based on the above refinements, this paper constructs a 4R model of live E-commerce marketing for chemical fibre enterprises and puts forward the following basic assumptions:

H1: The higher the level of relevance, the higher the customer conversion rate.

H2: The higher the level of responsiveness, the higher the customer satisfaction.

H3: The higher the level of relationality, the higher the customer's willingness to repurchase.

H4: The higher the level of return, the higher the marketing ROI.

Case Study Design

Using purposive sampling, cases were selected based on strict criteria to ensure typicality and comparative value. In terms of industry representativeness, the main business of the enterprise is the production and sale of chemical fibre products; in terms of practical depth, the enterprise should have carried out live e-commerce business for more than one year, and have a stable operation mode and data for analysis; strategic differences require the enterprise to have different focuses on the live marketing strategy, which is convenient for comparative analysis; and data accessibility requires the enterprise to cooperate with the study and provide interview opportunities and internal operation data. Based on these criteria, Company A and Company B (both pseudonyms) were selected for this study (sample size N=2). The core reason for choosing them is that they represent two different paths of live streaming transformation in the chemical fibre industry: company A focuses on functional fibres,

and its live streaming strategy is biased towards technical marketing and efficient conversion; company B focuses on sustainable regenerative fibres, and its live streaming strategy focuses on brand concept dissemination and value identity construction. This difference provides an excellent comparative sample for in-depth exploration of the application of 4R dimensions under different strategic orientations.

To ensure the comprehensiveness and objectivity of the information, this study collects case data through multiple channels. For primary data, a total of 12 semi-structured in-depth interviews were conducted with the head of the marketing department, members of the live streaming operation team, and 3-5 long-term cooperative customers of the two companies. For secondary data, the companies' live broadcast replay videos, official operation data reports, and social media backstage customer feedback records for the past six months were collected and analysed. At the same time, with the help of platforms such as Feigua Data and New Shake, public live streaming traffic, interaction rate, audience portrait, and other external performance indicators were obtained.

Questionnaire method

Questionnaire design

To verify the applicability of the theoretical model on a larger scale, a standardised questionnaire covering the 4R dimensions was designed in this paper. The questionnaire is divided into five parts. Each dimension was quantitatively assessed using a five-point Likert scale to ensure the comparability and quantifiability of the data [34]. The specific questionnaire design structure table is shown in Table 2. The table systematically shows the structure composition and measurement mode of the questionnaire designed in this paper, aiming to support the empirical validation of the 4R theoretical model through the standardised scale data [35,36]. The questionnaire is divided into five parts. Firstly, the size type, main product category, years of live broadcasting, and the function of the respondent are collected through the basic information survey part, to carry out sample stratification and subsequent heterogeneity analysis [37]. In the four core dimensions, the questionnaire sets up several indicators around relevance, responsiveness, relationship, and return, covering content design matching, customer interaction response efficiency, customer relationship maintenance measures, and the actual return from live broadcasting. All items are scored on a five-point Likert scale, which provides a quantifiable basis for qualitative subjective perceptions and facilitates subsequent quantitative research such as regression analysis and factor validation.

Survey Respondents and Sample Recovery

The survey object is the person in charge of the marketing department or the person in charge of the live operation of the chemical fibre enterprises that have already carried out the live E-commerce business nationwide [38,39]. Through the industry associations, industrial parks push, and the professional community release questionnaire link, a total of 450 questionnaires were issued, and 402 valid questionnaires were recovered, with an effective recovery rate of 89.3%. The interviewed enterprises cover different segments such as filament, staple fibre, regenerated fibre, functional fibre, etc., which have a good industry representation [40]. Figure 4 shows the pie chart of the distribution of sample enterprises' attributes. The figure shows the distribution proportion of four different types of fibres overall. The chart is divided into four parts, representing functional fibres, regenerated fibres, staple fibres, and filament fibres. Functional fibres account for 14.9% of the total and are shown in yellow, which could mean that functional fibres account for a relatively small share of overall fibre use. Recycled fibres accounted for 21.9%, shown in a slightly darker yellow, indicating that recycled fibres are used slightly more than functional fibres. Short fibres accounted for 28.1%, indicated by a darker blue colour, which is higher than the proportion of functional and regenerated fibres, indicating that short fibres occupy an important position in the fibre market [41]. Finally, filament fibres accounted for the largest share of 35.1%, represented in light blue, indicating that filament fibres are the most widely used of all fibre types. This distribution may reflect the demand and importance of different fibre types in specific applications, where filament fibres are preferred for their possible high performance or versatility.

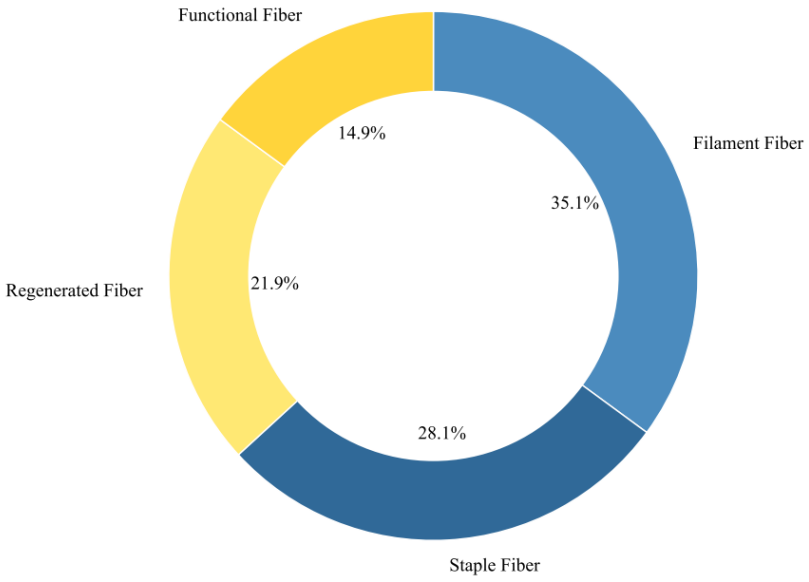

Figure 4. Pie Chart of Attribute Distribution of Sample Firms

Data Processing and Analysis Methods

The structural equation model (SEM) constructed in this study aims to test the comprehensive impact of the 4R strategy on marketing performance. The model is designed as follows:

(1) Latent Variables: The model contains four exogenous latent variables, i.e., Relevance, Response, Relationship, and Return. At the same time, an endogenous latent variable is set, i.e., comprehensive "Marketing Performance" (Marketing Performance), which is reflected by customer conversion rate, satisfaction, repurchase willingness, and ROI, and other indicators.

(2) Observed Variables: Each latent variable is measured by its corresponding 3-4 questionnaire items as observed variables (e.g., R1, R2, R3 to measure "relevance").

(3) Path hypothesis: The model is designed to test the significance of the path coefficients from the four exogenous latent variables to the endogenous latent variable "marketing performance", i.e., to validate H1 to H4.

Description of the Rationality and Innovativeness of the Research Methodology

Based on the 4R theory, this study finds that chemical fibre enterprises can significantly enhance the effectiveness of live e-commerce marketing by strengthening content relevance, improving response speed, deepening customer relationships, and accurately evaluating returns. Compared with traditional marketing theories, the 4R theory emphasises customer-centricity and focuses on establishing long-term interactive relationships and the direct feedback of marketing activities. For example, unlike studies based on the 4P theory, the 4R theory helps enterprises achieve higher customer conversion rates and loyalty through real-time interaction and relationship maintenance [42,43]. The empirical results of this study further validate the applicability and effectiveness of the 4R theory in industrial live broadcasting scenarios. At the same time, the introduction of the 4R theory and the deep integration of live E-commerce scenarios opens up the boundaries of the application of traditional customer relationship marketing theories under new digital channels, which has strong theoretical innovation significance and practical reference value [44]. Although existing research has explored the marketing strategies of live e-commerce in the field of consumer products, there is a significant lack of discussion on the systematic marketing strategies of chemical fibre enterprises, which are intermediate products, in the context of live e-commerce, especially in-depth analysis of the mechanisms influencing marketing effectiveness. This study aims to fill this gap by constructing a framework for the live e-commerce marketing strategy of chemical fibre companies based on the 4R theory. In addition, the combination of case study and questionnaire survey not only reveals the deep-rooted problems and effectiveness of the case but also verifies the universality of the theoretical

assumptions through the large-sample data, which ensures that the results of the study have both depth and breadth.

RESULTS AND DISCUSSION

Based on methodological design, this section first presents the differences in the effectiveness of the 4R strategy through a comparison of A and B companies (qualitative insights). It then uses SEM analysis of 402 questionnaires to quantify and verify the hypothetical relationship (quantitative evidence). Finally, it comprehensively discusses the theoretical contributions and practical approaches.

Case study results

Analysis of the effectiveness of the implementation of the 4R dimension in Company A

Through the in-depth analysis of the live practice of Company A and Company B, this study reveals the specific performance and effectiveness differences of the 4R strategy under different strategic orientations, as shown in Table 2.

Table 2. Comparison of live E-commerce strategies between Company A and Company B under the 4R dimension

Dimension (math.)	Company A Strategy Performance	Company B Strategy Performance	Comparative effectiveness evaluation	Problems
Relevance	Focus on industry pain points and product application cases embedded in the live content close to the customer procurement scenarios.	Product performance parameters are the main introduction; the content is more generalised and lacks scenario-based expression.	Company A's live-streaming customers stayed 27% longer than Company B's, and 35% more messages were left by interested customers.	Company B's content lacks relevance and has low customer stickiness.
Response	Equipped with an exclusive customer service team, set up an FAQ division of labour mechanism, average response time <30 seconds.	Random answers by anchors and assistants, unstable response time	Company A had a 92% response rate to inquiries on air, compared to 67% for Company B	Company B's customer feedback handling process is not standardised and has a high omission rate
Relation	Layered customer return visits within 48 hours of the live broadcast to establish customer profiling and follow-up mechanisms	Live coupon recovery rate as a customer maintenance metric, a lack of personalised follow-up	Company A's share of repeat customers increased to 41%, compared to 24% for Company B.	Company B lacks systematic customer management tools and has a low repurchase rate.

Dimension (math.)	Company A Strategy Performance	Company B Strategy Performance	Comparative effectiveness evaluation	Problems
Return	Track the customer conversion path through the CRM system, analyse the live ROI, and form a closed-loop review.	Focus on turnover statistics, lack of back-link data analysis, and retention tracking.	Company A's live streaming conversion rate reaches 6.8% and customer lifecycle value increases 18% year-over-year.	Company B lacks a mechanism to assess long-term benefits, and ROI calculations are sketchy.

From the comparison in Table 2, it can be seen that there are significant differences in the implementation level of the 4R strategy between Companies A and B, which directly leads to the gap in marketing effectiveness and provides valuable insights for the industry. Relevance is the cornerstone of content attraction, and Company A realized strong relevance by embedding its products into customers' "application scenarios" and "business pain points", and the length of time customers stayed and the number of messages they intended to leave far exceeded that of Company B, which was mainly focused on the introduction of product parameters. This shows that in B2B live broadcasting, the core of the content does not lie in "how good our products are", but in "how our products help customers solve problems". Reactivity is the bridge to build trust: Company A's standardised "<30 seconds" response mechanism reflects its extreme attention to customer experience, and its 92% response rate directly translates into customer trust. On the other hand, Company B's randomised response mode is prone to customer loss. This reveals that in live broadcasting, instant interaction is not only a means to enliven the atmosphere, but also a demonstration of professional service capability. Relationality is the key to repurchase: Company A incorporated live streaming customers into its CRM system for subsequent refined operation, and achieved a repurchase rate of 41%, while Company B stayed at one-time coupon stimulation and lacked long-term relationship maintenance, resulting in insufficient customer stickiness. This proves that the value of live broadcasting goes far beyond on-the-spot transactions and lies in the acquisition and cultivation of high-quality potential customers. Returns are the driving force for continuous optimisation; Company A's fine-tuned tracking of ROI and customer lifecycle value enabled them to continuously optimise their launch strategy, while Company B's cursory evaluation of returns made their marketing investment like "blind men feeling an elephant". A scientific return evaluation system is a prerequisite for live marketing to shift from a cost centre to a profit centre. According to a systematic review of Company A's live e-commerce operation, combined with on-site observation and data analysis, Company A's performance in the 4R dimensions is as follows:

(1) Relevance: By accurately controlling the needs of the audience, Company A focuses on the application cases of functional fibres in the fields of clothing, home textiles, and medical protection

during the live broadcast, and the content is close to the actual needs of the industry, with a relevance score of 4.7 (out of 5 points).

(2) Responsiveness (Response): During the live broadcasting process, several customer service personnel were set up to respond online in real time, while the anchor could instantly handle more than 80% of the audience's questions, with an overall responsiveness rating of 4.6.

(3) Relation: Company A has established a systematic customer management mechanism and continues to deepen customer relationships through live booking, customer points, exclusive discounts, etc., with a relationship score of 4.5.

(4) Return: live broadcasting has led to an average monthly sales growth of more than 30%, and the customer repurchase rate has increased to 48%, with a return score of 4.8. From a comprehensive point of view, Company A has constructed a stable live broadcasting E-commerce conversion closed loop by accurately matching the elements of the 4Rs, effectively maximising the effectiveness of marketing.

Analysis of the effectiveness of the implementation of the 4R dimension in Company B

Company B shows some differences in the implementation of live E-commerce strategy compared to Company A:

(1) Relevance: Although Company B focuses on the dissemination of the concept of environmentally friendly recycled fibres, the content of the live broadcast is biased towards self-promotion of the product and lacks in-depth docking with the customer's application scenarios, resulting in a relevance rating of only 3.8.

(2) Response: Company B has set up a professional customer service team, but some of the complex issues need to be directed to private mail consultation, resulting in an immediate response rate of less than 70%, with a response rate of 3.9.

(3) Relation: Customer management mainly relies on traditional after-sales visits, and there is a lack of continuous interaction mechanisms after the live broadcast, with a relationship score of 3.6.

(4) Return: Although the exposure of live broadcast is high, the conversion rate is low, the repurchase rate of customers is less than 20%, and the return score is 3.5. It can be seen that there are obvious shortcomings in the implementation of the 4R system in Company B, especially in the relevance of content and maintenance of customer relationships that need to be further optimised.

Case Comparison Summary

Comparing A and B reveals that success in chemical fibre live e-commerce hinges on: highly relevant content, rapid response mechanisms, refined relationship management, and robust ROI systems. Figure 5 presents a comprehensive comparison radar chart of the 4R dimensions of Company A and

Company B. The radar chart compares the performance of Company A and Company B on four dimensions: response, association, return, and relevance. Company A performs better on response and return, while Company B performs better on relevance and correlation, suggesting that Company A may be better at customer service and return on investment, while Company B is more competitive on customer relationships and product relevance.

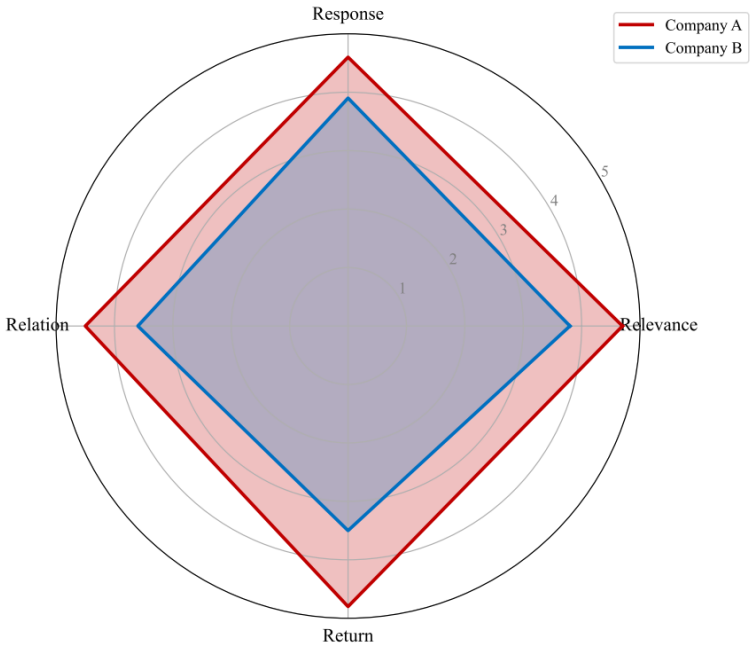

Figure 5. Comprehensive comparison radar chart of the 4R dimensions of Company A and Company B

Results of Questionnaire Data Analysis

Descriptive Statistical Analysis

Survey data (N=402) indicates significant investment in live e-commerce: 78% of firms stream for>1 year, 65% have dedicated teams, and 52% conduct >5 streams monthly. The following Table 3 samples enterprises' live E-commerce base situation statistics, from the table can be seen that the interviewed chemical fibre enterprises' overall layout in the live E-commerce shows a strong willingness to invest and a certain degree of maturity. In terms of the number of years of live broadcasting, about 78.1% of the enterprises have been carrying out live broadcasting business for more than 1 year, of which nearly five have been in a "1-3 years" interval, showing the centralised distribution of industry live broadcasting experience. In terms of organisational structure, 65% of enterprises have set up a dedicated live broadcast team, indicating that most enterprises have elevated live broadcasts from an auxiliary tool to a core business module. In terms of live broadcast frequency, more than half (52%) of the enterprises carry out more than 5 live broadcasts per month, reflecting that live broadcast has

become a high-frequency marketing tool. In addition, in terms of platform selection, most enterprises showed a trend of "multiple platforms in parallel", with Jitterbug (67.9%) as the main position, and a certain penetration rate of video number, fast hand, and Taobao live broadcasting, showing that enterprises are choosing more compatible live broadcasting channels according to their product positioning and customer preferences.

Table 3. Statistics of live E-commerce basics of the sampled companies

Sports event	Options classification	Number of enterprises (n)	Percentage (%)
Years of live enterprise broadcasting	Less than 1 year	88	21.9
	1-3 years	198	49.3
	More than 3 years	116	28.8
Whether to set up an independent live-streaming team	be	261	65.0
	clogged	141	35.0
The average number of live broadcasts per month for enterprises	No more than 2	96	23.9
	3-5 sessions	97	24.1
	More than 5	209	52.0
Use of live streaming platforms (multiple choice)	jitterbug	273	67.9
	video number	187	46.5
	violin	134	33.3
	Taobao Live	105	26.1

Reliability and Validity Tests

Table 4 depicts the results of the reliability and validity test. From Table 4, it can be seen that the questionnaire of this study has reached a high standard in terms of reliability and validity. The Cronbach's alpha coefficient of the overall scale is 0.921, and the coefficients of the four dimensions are over 0.84, which indicates that the indicators of the questionnaire have excellent internal consistency, and the scale design has stability and reliability. In terms of validity test, the KMO values of all dimensions are greater than 0.8, and the overall questionnaire is 0.887, which shows that the sample data are suitable for structural factor analysis; meanwhile, Bartlett's spherical test is significant in all dimensions (Sig.< 0.001), which further verifies that there is a strong correlation between the variables, and provides good statistical foundations for the subsequent factor extraction and model fitting. Statistical basis for the subsequent factor extraction and model fitting.

Table 4. Reliability and Validity Test Results

Dimension (math.)	Cronbach's Alpha	KMO value	Bartlett's test of sphericity (Sig.)	instructions
relatedness	0.873	0.842	<0.001	Reliability and validity are of an excellent standard.
reactivity	0.885	0.869	<0.001	The indicator structure is suitable for factor extraction.
relational	0.864	0.813	<0.001	Good data structure
rewarding	0.841	0.826	<0.001	Scale design is scientific, and statistical tests are significant.

Factor analysis results

The four common factors were extracted through principal component analysis, which cumulatively explained 78.5% of the total variance, and the loadings of each indicator were above 0.7, further validating the rationality of the four dimensions of relevance, responsiveness, relationship, and return. Table 5 shows the principal component loadings for each dimension of 4R.

Table 5. 4R Principal Component Loadings for Each Dimension

Variable Item Number	Correlation factor loadings	Reactivity factor loadings	Relational factor loadings	Return factor loadings
R1	0.812	-	-	-
R2	0.847	-	-	-
R3	0.790	-	-	-
RS1	-	0.801	-	-
RS2	-	0.828	-	-
RS3	-	0.774	-	-
RL1	-	-	0.839	-
RL2	-	-	0.861	-
RL3	-	-	0.802	-
RT1	-	-	-	0.783
RT2	-	-	-	0.808
RT3	-	-	-	0.794

Structural Equation Modelling

To test the validity of the theoretical model, the structural equation model was constructed in this study using AMOS 24.0. The model fitting results showed that all the fitting indices reached or were better than the recommended standards in academia ($\chi^2/df = 2.13 < 3$, CFI = 0.96 > 0.90, TLI = 0.95 >

0.90, RMSEA = 0.052 < 0.08), which indicated that the theoretical model constructed in this study had a good fit with the sample data, and that the model is established as a whole. The standardised coefficient test results of each path are as follows:

(1) Correlation → marketing performance (H1): the standardised path coefficient is 0.68 ($p < 0.001$). This result strongly supports H1, indicating that the relevance of live content to customer demand is one of the most central drivers affecting marketing performance. In practice, for every one standard unit increase in the relevance of live content, marketing performance will subsequently increase by 0.68 standard units.

(2) Reactivity → Marketing Performance (H2): The standardised path coefficient is 0.62 ($p < 0.001$). This result supports H2, suggesting that a firm's quick and professional response on the air has a significant positive impact on improving customer satisfaction and final performance.

(3) Relationality → Marketing Performance (H3): The standardised path coefficient is 0.71 ($p < 0.001$). This is one of the strongest influences of all paths, validating H3. It suggests that building and maintaining long-term customer relationships through live streaming is critical to improving long-term performance indicators such as customer repurchase intent and loyalty.

(4) Returnability → Marketing Performance (H4): The standardised path coefficient is 0.74 ($p < 0.001$). This path coefficient is the highest and strongly supports H4. This reveals a key management insight: a system that scientifically measures and evaluates returns is itself the strongest driver of continuous optimisation of marketing performance. It motivates companies to allocate resources to the most efficient segments, creating a virtuous cycle.

Based on this study, the following practical framework is proposed for chemical fibre enterprises in live e-commerce marketing: first, in terms of relevance, enterprises should conduct in-depth research on customer demand, design live content according to customer application scenarios, and ensure that the content is closely integrated with the actual needs of customers; second, in terms of responsiveness, enterprises need to establish a professional customer service team and a rapid response mechanism to ensure that customer inquiries can be answered in a timely and accurate manner; Once again, in terms of relationship, enterprises should improve the customer relationship management system, carry out hierarchical management of customers, and strengthen the maintenance of customer relationship through regular return visits, exclusive services, etc. Finally, in terms of return, enterprises should set clear live broadcasting marketing objectives, such as customer conversion rate, customer retention rate, and growth of customer lifecycle value, etc., and accordingly evaluate the marketing effect and continuously optimise the marketing strategy.

Case comparisons and SEM analysis confirm the 4R theory's applicability and explanatory power for chemical fibre live e-commerce. The results of the study show that all four dimensions of relevance,

responsiveness, relationality, and rewardingness have a significant positive effect on marketing performance. Among them, the path coefficients of relationality (β=0.71) and rewardingness (β=0.74) are slightly higher than those of relevance (β=0.68) and responsiveness (β=0.62), a phenomenon that has profound implications in the context of the B2B industry.

This result reveals the successful logic of live e-commerce for chemical fibre enterprises: attracting customers with "relevance" content and establishing initial trust with "reactivity" interaction are only the "knocking bricks" of marketing. This is only the marketing "knocking brick". What builds a corporate moat and realises long-term value is the subsequent "relational" in-depth operation and data-driven "rewarding" closed-loop management. This finding not only deepens the application of the 4R theory but also points out that in the B2B live broadcasting scenario, marketing activities should not be limited to the live broadcasting room, but should be extended to the whole chain of customer lifecycle management.

Synthesising the case insights and data conclusions, this study builds a set of actionable live e-commerce marketing practice paths for chemical fibre companies. In terms of content strategy, enterprises should shift from "product thinking" to "customer scenario thinking". Before the live broadcast, in-depth research on customer pain points; live broadcast, more use of "case study + solution" mode; live broadcast, according to customer feedback, iterative content. In the interactive mechanism, the establishment of "anchor + technical experts + customer service" live iron triangle team, the development of standard Q&A SOP, to ensure that key issues are answered professionally and quickly, and the use of intelligent customer service tools to assist in dealing with high-frequency problems. In terms of customer operation, the potential customer leads obtained from the live broadcast are seamlessly connected to the CRM system, stratified according to the customer's intention and purchasing potential, and followed up and cultivated by the sales team in a differentiated manner to achieve the goal of "sales" from "traffic" to "retention" to "sales". The sales team will carry out differentiated follow-up and cultivation to realise the transformation from "traffic" to "retention" and then to "sales". In terms of performance evaluation, we establish a multi-dimensional ROI evaluation model that includes viewing-conversion rate, lead cost, customer life cycle value (LTV), etc., and review the data regularly to feed back the data insights into the optimisation of content planning, traffic placement, and customer operation strategies.

Proposed Framework for Live E-commerce Marketing Strategy

Based on the findings of this study, we propose a comprehensive framework for the live e-commerce marketing strategy of chemical fibre enterprises based on the 4R theory. The proposed framework integrates the dimensions of Relevance, Response, Relation, and Return to enhance marketing performance. Figure 6 illustrates the proposed framework.

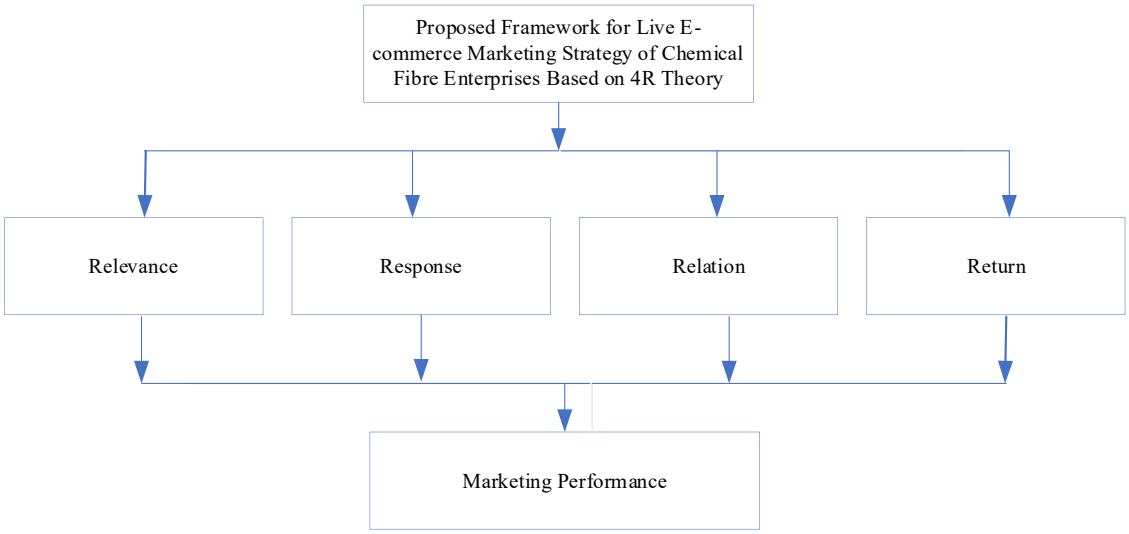

Figure 6: Proposed Framework for Live E-commerce Marketing Strategy of Chemical Fibre Enterprises Based on 4R Theory

The framework highlights the importance of Relevance, Response, Relation, and Return in enhancing marketing performance. By integrating these dimensions, chemical fibre enterprises can achieve better customer conversion rates, satisfaction, repurchase intentions, and overall marketing ROI.

CONCLUSION

This study confirms that the 4R theory resolves core contradictions in live-streaming e-commerce, including content specialisation, long decision-making cycles, and low transaction frequency. It investigates the live E-commerce marketing strategies of chemical fibre enterprises through the lens of the 4R theory—Relevance, Response, Relationship, and Return—offering a systematic and data-driven exploration of how traditional B2B manufacturing firms can adapt to emerging digital marketing channels. The findings demonstrate that all four dimensions of the 4R framework significantly influence marketing performance. Specifically, relevance enhances customer engagement by aligning content with application scenarios; responsiveness fosters real-time interaction and satisfaction through structured customer service mechanisms; relationship building strengthens customer loyalty via sustained interaction and hierarchical management; and return improves overall marketing efficiency by linking live broadcast activities with measurable performance indicators such as ROI and repurchase rates. Empirical evidence from the case studies of Company A and B, supported by a questionnaire survey of 402 valid responses and SEM modelling, shows that companies adopting a comprehensive 4R-based approach (like Company A) achieved superior performance in customer conversion, satisfaction, and long-term retention. These results validate the theoretical applicability of 4R principles in live e-commerce contexts and offer actionable strategies for other B-end manufacturing enterprises undergoing digital transformation.

The research provides theoretical enrichment and practical guidance, extending relationship marketing into live E-commerce and addressing challenges in upstream industrial chains. The 4R-based strategy model fills the research gap and serves as a replicable framework. Despite robust data, limitations include a relatively narrow sample scope and reliance on participant-reported data. Future research can further strengthen these findings by incorporating more diverse firms across regions and product types and by integrating real-time consumer behavioural data to explore the demand-side dynamics of live E-commerce. Overall, this study underscores the strategic value of integrating the 4R theory into live E-commerce practices and offers a new pathway for manufacturing enterprises to enhance customer value, brand influence, and operational efficiency in the digital age.

Conflicts of Interest

The author declares no conflict of interest.

Funding

This research received no external funding

REFERENCES

[1] García-Salirrosas EE, Acevedo-Duque Á, Marin Chaves V, Mejía Henao PA, Olaya Molano JC. Purchase intention and satisfaction of online shop users in developing countries during the COVID-19 pandemic. Sustainability. 2022; 14(10):6302. https://doi.org/10.3390/su14106302

[2] Rachmawati D, Akbari TT, Adithia S. Social entrepreneurship marketing communication strategy in maintaining customer loyalty. Commun: J Commun Stud. 2021; 8(1):76–93. https://doi.org/ 10.37535/101008120216

[3] Nacchiero R, Massari GF, Giannoccaro I. Supply chain transformative capabilities and their micro-foundations for circular economy transition: a qualitative study in made-in Italy sectors. Bus Strategy Environ. 2024; 33(8):8695–8715. https://doi.org/10.1002/bse 3939

[4] Sesa PGE, Hasnawati H. Analysis of financial and non-financial performance of the 3 largest companies in the United Kingdom's apparel retail industry for 2018-2022. Enrich: J Multidiscip Res Dev. 2023; 1(9):610–629.

[5] Nazir S, Doni F. Nexus of circular economy R0 to R9 principles in integrated reporting: insights from a multiple case study comparison. Bus Strategy Environ. 2024; 33(5):4058–4085. https://doi.org/10.1002/bse 368

[6] Schultz DE. Integrated marketing communications. Journal of Promotion Management. 1992; 1(1):99-104. https://doi.org/ 10.1300/J057v01n01_07

[7] Sugg B. Circular textiles innovation during COVID-19: not the silver lining some had hoped for. J Fash Mark Manag. 2024; 28(4):672–687.

[8] Jauhar SK, Chakma BR, Kamble SS, Belhadi A. Digital transformation technologies to analyze product returns in the e-commerce industry. Journal of Enterprise Information Management. 2024; 37(2):456-487. https://doi.org/10.1108/JEIM-09-2022-0315

[9] Agitha N, Husodo AY, Afwani R, Al Anshary FM. The design of an e-commerce system to increase sales productivity of home industry in Indonesia. International Journal on Informatics Visualization. 2023; 7(1):70-76. https://doi.org/ 10.30630/joiv.7.1.1589

[10] Alkan Ö, Güney E, Kılınç A. Predictors of online shopping behavior of women in Turkey: a model and empirical study. Int J Contemp Econ Adm Sci. 2023; 13(1):410–442.

[11] Bastos Rudolph LT, Bassi Suter M, Barakat SR. The emergence of a new business approach in the fashion and apparel industry: the ethical retailer. J Macromarketing. 2023; 43(3):367–383. https://doi.org/10.1177/02761467231180456

[12] Zhao GQ, Vazquez-Noguerol M, Liu SF, Prado-Prado JC. Agri-food supply chain resilience strategies for preparing, responding, recovering, and adapting to unexpected crisis: a cross-country comparative analysis from the COVID-19 pandemic. J Bus Logist. 2024; 45(1):e12361. https://doi.org/10.1111/jbl.12361

[13] Tang GN, Luo WH, Zheng YP, Zhou QF. Path constitution: building organizational resilience for sustainable performance. Economics. 2023; 17(1):20220048. https://doi.org/10.1515/econ-2022-0048

[14] Hartanto S. Zalora, earth edit: a corporate strategy for sustainable fashion products. Prod: J Desain Prod (pengetah Dan Peranc Prod). 2022; 5(2):83–90. https://doi.org/10.24821/productum.v5i2.5134

[15] Buchel S, Hebinck A, Lavanga M, Loorbach D. Disrupting the status quo: a sustainability transitions analysis of the fashion system. Sustainability: Sci, Pract Policy. 2022; 18(1):231–246. https://doi.org/10.1080/15487733.2022.2040231

[16] Huskey M, Cho E. Exploring small fashion retailers' green efforts in supply chain management and coping strategies during COVID-19. J Fam Consum Sci. 2022; 114(4):16–27. https://doi.org/10.14307/JFCS114.4.16

[17] Vivas KA, Vera RE, Dasmohapatra S, Marquez R, Van Schoubroeck S, Forfora N, Azuaje AJ, Phillips RB, Jameel H, Delborne JA. A multi-criteria approach for quantifying the impact of global megatrends on the pulp and paper industry: insights into digitalization, social behavior change, and sustainability. Logistics. 2024; 8(2):36. https://doi.org/10.3390/logistics8020036

[18] Karyono O, Kamiruddin K. Strategy for building sharia-conscious competitiveness in small and medium enterprises based on local wisdom. Al-intaj: J Ekon Dan Perbank Syariah. 2024; 10(2):331–344. https://doi.org/10.29300/aij.v10i2.4824

[19] Wandosell G, Parra-Meroño MC, Alcayde A, Baños R. Green packaging from consumer and business perspectives. Sustainability. 2021; 13(3):1356. https://doi.org/10.3390/su13031356

[20] Kumar S, Aithal P. Tech business analytics in the quaternary industry sector. Int J Case Stud Bus IT Educ. 2024; 8(2):69–159.

[21] Zhao WJ, Osman LH, Faezah JN. Developing a conceptual model of factors influencing express delivery packaging recycling behaviors of E-commerce enterprises in China. PaperASIA. 2024; 40(6b):111–122.

[22] Zhu YW, Zhang XM, Yan SM, Zou L. Research on spatial patterns and mechanisms of live streaming commerce in China based on geolocation data. International Journal of Geo-Information. 2023; 12(6):229. https://doi.org/10.3390/ijgi12060229

[23] Wu MY, Kong K. Business strategies responding to COVID-19: Experience of Chinese corporations. Corp Gov: Int J Bus Soc. 2021; 21(6):1072–1099. https://doi.org/10.1108/CG-10-2020-0475

[24] Bureekhampun S, Maneepun C. Eco-friendly and community sustainable textile fabric dyeing methods from Thai buffalo manure: from pasture to fashion designer. SAGE Open. 2021; 11(4):21582440211058201. https://doi.org/10.1177/21582440211058201

[25] Zhu ZJ Bai YH, Dai W, H Liu D, Hu Y. Quality of E-commerce agricultural products and the safety of the ecological environment of the origin based on 5G Internet of Things technology. Environmental Technology & Innovation. 2021; 22:101462. https://doi.org/10.1016/j.eti.2021.101462

[26] Chhabra S, Sindhi S, Nandy M. Factors affecting the adoption of slow fashion–an exploratory study of multiple stakeholders. J Macromarketing. 2022; 42(4):492–509. https://doi.org/10.1177/02761467221116294

[27] Xu HY, Song HY. Key factors influencing Chinese consumers' demand for naturally dyed garments: data analysis through KJ method and KANO model. Sustainability. 2024; 16(3):1189. https://doi.org/ 10.3390/su16031189

[28] Nindyawati E, Salsabila RK, Siswahyudi J, Puspitasari RD, Putri DK, Mashudi S. Wacode "waters coco delight" & VCO "virgin coconut oil": Innovation coconut products. J Inov Dan Pengemb Has Pengabdi Masy. 2024; 2(2):260–271. https://doi.org/10.61650/jip-dimas.v2i2.623

[29] Di L, Zhi-Ping Q. Can E-commerce reduce urban CO2 emissions? Evidence from the national E-commerce demonstration cities policy in China. Environ Sci Pollut Res. 2023; 30(20):58553–58568. https://doi.org/ 10.1007/s11356-023-26657-3

[30] Kwan YY, Ngo D, Shi T. Sustainable operations management practices in the textiles, apparel, and footwear industry. J Supply Chain Oper Manag. 2024; 22(2):63.

[31] Zhang ZY, Zhu JG, Qi Q. Research on the recyclable design of wooden furniture based on the recyclability evaluation. Sustainability. 2023; 15(24):16758. https://doi.org/10.3390/su152416758

[32] Nooh MN. Designing a sportswear strategic marketing plan: a data analytics approach. ASEAN Entrep J. 2022; 8(1):53–70.

[33] Dong L. Harnessing bio-graphic design for innovative visual merchandising in the biotechnology sector. J Commer Biotechnol. 2024; 29(4):309–319.

[34] Li WJ, Li CG. Path analysis of the impact of digital transformation on export performance of textile and apparel companies. Open J Bus Manag. 2022; 10(6):2903–2914. https://doi.org/10.4236/ojbm.2022.106143

[35] Panju M. What goes around comes around? The sustainability paradox of second-hand clothing marketplaces in a cross-cultural context. East Afr J Interdiscip Stud. 2024, 7(1):1–27. https://doi.org/10.37284/eajis.7.1.1799

[36] Zhao W, Liang ZY, Li BR. Realizing a rural sustainable development through a digital village construction: experiences from China. Sustainability. 2022, 14(21):14199. https://doi.org/ 10.3390/su142114199

[37] Peng SY, Liu JY, Geng Y. Assessing strategies for reducing the carbon footprint of textile products in China under the shared socioeconomic pathways framework. Climate Change Econ. 2022; 13(1):2240004. https://doi.org/10.1142/S2010007822400048

[38] Duan SC, Lin J, Van Dijck J. Producing new farmers in Chinese rural life E-commerce: Platformization, labor, and live E-commerce sellers in Huaiyang. Chin J Commun. 2023; 16(3):250–266. https://doi.org/ 10.1080/17544750.2023.2203939

[39] Periyasami S, Periyasamy AP. Metaverse as a future promising platform business model: a case study on the fashion value chain. Businesses. 2022, 2(4):527–545. https://doi.org/ 10.3390/businesses2040033

[40] Eppinger E. Recycling technologies for enabling sustainability transitions of the fashion industry: status quo and avenues for increasing post-consumer waste recycling. Sustainability: Sci, Pract Policy. 2022; 18(1):114–128. https://doi.org/10.1080/15487733.2022.2027122

[41] Ly B. Competitive advantage and internationalization of a circular economy model in apparel multinationals. Cogent Bus Manag. 2021; 8(1):1944012. https://doi.org/10.1080/23311975.2021.1944012

[42] Franconi A, Ceschin F, Peck D. Structuring circular objectives and design strategies for the circular

economy: a multi-hierarchical theoretical framework. Sustainability. 2022; 14(15):9298. https://doi.org/10.3390/su14159298

[43] Mishra O. Principles of frugal innovation and its application by social entrepreneurs in times of adversity: An inductive single-case approach. J Entrep Emerg Econ. 2021; 13(4):547–574. https://doi.org/10.1108/JEEE-07-2020-0247

[44] Mishra S, Jain S, Malhotra G. The anatomy of circular economy transition in the fashion industry. Soc Responsib J. 2021; 17(4):524–542. https://doi.org/ 10.1108/SRJ-06-2019-0216

Appendix: Questionnaire on the Marketing Strategy of Live E-commerce for Chemical Fibre Enterprises

Dear Ms./Mr.:

Hello!

We are a research group from XX University/Research Institution, and we are conducting academic research on "**Live E-commerce Marketing Strategy of Chemical Fibre Enterprises Based on 4R Theory**". This study aims to understand the current practice of chemical fibre enterprises in China in the field of live e-commerce, and explore effective marketing strategies, in order to provide theoretical reference and practical guidance for the development of the industry.

Your experience and insights are crucial to this study. This questionnaire is filled out in an anonymous way, and all the data is only used for academic research. We will keep your personal information and answers strictly confidential, so please feel free to fill it out. The questionnaire will take approximately 5-8 minutes of your time.

We sincerely thank you for your support and participation!

Part I: Basic Information of Enterprises and Individuals

(Note: This part of the information is only used for the background analysis of the sample, not for other purposes.)

1. What is the size of your organisation?

○ A. Large enterprise (≥1000 employees)

○ B. Medium-sized enterprise (300-999 employees)

○ C. Small business (<300 employees)

2. What is the main chemical fibre product category of your enterprise? (Multiple choice)

○ A. Filament fibres (e.g. polyester filament, nylon filament, etc.)

B. Staple fibres (e.g. polyester staple fibre, viscose staple fibre, etc.)

C. Recycled Fibres (e.g. recycled polyester, recycled cellulose fibre, etc.)

D. Functional/differentiated fibres (e.g., moisture wicking, flame retardant, antibacterial fibres, etc.)

○ E. Other (please specify) _____

3. How long has your company been conducting live e-commerce business?

○ A. Less than 1 year

○ B. 1-3 years

○ C. More than 3 years

4. What are the main functions of your position in your organisation?

○ A. Head of Marketing/Branding

○ B. Head of live broadcast operation/new media

○ C. Sales Manager

○ D. Senior management

○ E. Others (please specify) _____

Part II: Evaluation of Live E-Commerce Marketing Strategy

(Note: Please rate the following description based on the **reality** of live e-commerce in your organisation. The scale is 1=Strongly Disagree, 2=Disagree, 3=Fairly, 4=Agree, 5=Strongly Agree)

Dimension	Question Item Number	Measurement Question Item	1	2	3	4	5
Relevance	R1	Our live content effectively demonstrates the specific applications of our products (e.g., what fabrics are used, clothing styles, etc.).	○	○	○	○	○
	R2	Our live broadcast topics can accurately hit the business pain points (e.g. cost, process, new function requirements) of our target customers (e.g. buyers, designers).	○	○	○	○	○
	R3	Our live content is differentiated and unique compared to our competitors.	○	○	○	○	○
Response	RS1	During the live broadcast, professional and technical questions raised by customers can be answered promptly and accurately.	○	○	○	○	○

	RS2	We have established a clear process to ensure that questions that cannot be answered immediately during the live broadcast can be effectively followed up on after the broadcast.	○	○	○	○	○
	RS3	We will actively respond to the interaction of the audience in the live broadcast (e.g. comments, likes) to create a good interactive atmosphere.	○	○	○	○	○
Relation	RL1	We view live broadcasting as a channel to build long-term relationships with customers, not just a single sale.	○	○	○	○	○
	RL2	We will stratify management and personalised maintenance for interested customers identified through live streaming.	○	○	○	○	○
	RL3	We will maintain continuous contact and interaction with customers through regular live broadcasts or community operations.	○	○	○	○	○
Return	RT1	Overall, our live streaming marketing campaigns have achieved a satisfactory return on investment (ROI).	○	○	○	○	○
	RT2	Through live broadcast marketing, our company's brand awareness	○	○	○	○	○

		and industry influence have been effectively enhanced.					
	RT3	Live streaming has significantly increased our customer repurchase rate and customer loyalty.	○	○	○	○	○
Marketing Performance	MP1	Our live streaming campaign was effective in attracting new potential customers.	○	○	○	○	○
	MP2	Our live events are highly effective in driving sales order conversions.	○	○	○	○	○
	MP3	Overall, customer satisfaction with our live events is high.	○	○	○	○	○