Critical Literature Review:

Revolutionizing China's Apparel SMEs: The Critical Role of AI and Big Data in Digital Transformation

LCDB7009 Critical Literature Review

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Executive Summary

This critical literature review explores existing research on the impact of digital transformation on apparel small and medium-sized enterprises (SMEs) in China, highlighting both advances and gaps. Scholars broadly agree that digital technologies — such as artificial intelligence (AI), big data analytics, e-commerce and cloud computing — have fundamentally altered the operational landscape for apparel SMEs, enabling faster production cycles, customized marketing, and broader market access. There will be divided into three parts. The first part is to introduce critical literature review including the definition, purpose, significance, and the content. The second part presents 100 annotated bibliographies in the form of table. Clearly record the literature have read by marking useful information and keywords. And the third part is an overview of the literature review work during these three months. Using a narrative review approach, the literature evaluates existing theories on technological integration, focusing on that digitalization can enhance supply chain transparency, improve customer engagement, and promote innovation in product design and retail strategies.

It examines the ways in which AI enhances design innovation, supply chain management, and customer experience, while big data improves decision-making, market prediction, and operational efficiency. While some authors argue digital transformation is universally beneficial, critical perspectives warn that it may deepen inequalities between digitally advanced and lagging firms. Overall, the review underscores the need for more nuanced, SMEs-focused research that considers the diversity of experiences within China's apparel industry.

Given the limited time available for conducting an extensive literature review and the inherent subjectivity of the narrative review method, the next stage of the review will focus on critically assessing existing studies to enhance the initial findings, synthesizing more objective and comprehensive insights to strengthen the overall analysis.

Keywords: Literature Review, Digital Transformation, AI, Big-data,SMEs.

Part 1

1.1 The Definition of Literature Review

A literature review is a comprehensive evaluation and synthesis of existing research and scholarly work on a specific topic or research question. It involves systematically searching, analyzing, and integrating a wide range of sources, including scholarly articles, books, conference papers, and other relevant materials, to identify key themes, trends, gaps, and debates within the field. A literature review highlights important theories, methodologies, findings, and areas of controversy, providing essential context and justification for a new study(Lawrence A., et al., 2021). By doing so, it establishes a solid foundation for the research and clarifies how the current study will contribute to advancing knowledge.

Literature reviews can function as standalone academic works, such as review articles, or serve as integral components of larger projects like thesis, dissertations, or research papers. Rather than simply summarizing individual studies one after another, an effective literature review organizes the information thematically, methodologically, or chronologically to reveal connections, patterns, and divergences across the body of literature (Cooper, H. M. ,1989).

A well-executed literature review goes beyond description to offer critical analysis and synthesis. It evaluates the strengths and weaknesses of existing research, highlights significant contributions, and identifies gaps that future research should address. It should be comprehensive yet focused, ensuring that the discussion remains directly relevant to the research question.

1.2 The Purpose of Literature Review

The purpose of a literature review is to establish a foundation for understanding the current state of knowledge, situate new research within the context of existing work, and highlight areas that require further investigation. It plays a crucial role in the research process by providing a comprehensive overview of existing studies, helping readers trace the historical development and current status of the field(Chris Hart ,2018). Through a careful examination of past research, the literature review allows

researchers to position their work within an ongoing scholarly conversation, demonstrating how their study contributes to, extends, or challenges existing knowledge.

A key function of the literature review is to identify gaps, inconsistencies, or under-explored areas in the literature, thereby emphasizing the originality and significance of the current study (Mark Petticrew & Helen Roberts,2006).. By critically analysing prior work, researchers can show how their research addresses specific limitations or unanswered questions, strengthening the rationale for their study. Furthermore, a thorough review evaluates the strengths and weaknesses of previous methodologies and theoretical frameworks, guiding researchers in selecting the most appropriate methods and approaches for their own work.

Beyond merely summarizing past studies, a literature review synthesizes insights from diverse sources to reveal patterns, trends, and areas of consensus or debate within the field. This synthesis helps to build a cohesive understanding of the topic, allowing researchers to frame their research questions more precisely and to align their study with broader theoretical and empirical developments(Greetham, B.,2021). Additionally, a strong literature review prevents redundancy by ensuring that new research contributes meaningful advancements rather than duplicating previous efforts. Overall, the literature review is not only a critical foundation for scholarly inquiry but also a dynamic tool for advancing knowledge, shaping research design, and informing practical applications(Jose L. Galvan& Melisa C. Galvan, 2017)

1.3 The Significance of Literature Review

A literature review is a cornerstone of rigorous academic research, offering critical value to both the researcher and the broader scholarly community. Its significance lies in providing a solid foundation for research and academic inquiry. A well-conducted literature review helps researchers understand the current state of knowledge within a particular field, offering essential background information and clarifying how new research aligns with or diverges from previous work. It identifies gaps, contradictions, and unresolved issues, thereby contextualizing the research within the broader academic conversation(Wayne C. Booth, et al.2016).By critically evaluating existing

studies, researchers can refine their methodologies and justify their chosen approaches, ensuring that their work builds upon or addresses limitations found in prior research.

Moreover, a thorough literature review plays an essential role in preventing redundancy. By highlighting areas that have already been explored, it allows researchers to focus on making original contributions rather than unintentionally replicating previous studies. In doing so, the literature review also provides a roadmap for avoiding well-trodden paths and encourages innovative thinking. By critiquing the methodologies used in earlier work and connecting relevant concepts, theories, and models, the review supports informed methodological choices (e.g., selecting case studies versus surveys) and offers a critical evaluation of the appropriateness of various research designs(Jesson, J.,et al., 2011) Additionally, synthesizing insights from diverse studies allows researchers to advance existing theoretical frameworks (such as the innovation diffusion theory) and propose practical implications that may inform policy decisions, industry practices, or future research initiatives.

The process of conducting a literature review also compels researchers to critically assess the sources they engage with, fostering a deeper understanding of the strengths, weaknesses, and biases that exist within the body of literature. This level of critical engagement not only strengthens the researcher’s own study but also contributes to the academic field by promoting a culture of rigorous evaluation and thoughtful synthesis. Researchers become more adept at discerning the quality of evidence, identifying methodological flaws, and appreciating the broader context in which studies were conducted(Torraco, R. J. ,2005).

Furthermore, by integrating findings from a wide range of sources, the literature review provides a comprehensive and nuanced understanding of the subject area. It reveals patterns, trends, areas of consensus, as well as points of contention and debate, offering a richer context for situating new research. This holistic view helps to shape and sharpen research questions, inform theoretical positioning, and ensure that new studies are well-grounded within the field's intellectual landscape(Boote, D. N., & Beile, P.,2005). It also enables the identification of emerging areas of interest or novel intersections between previously separate strands of research.

1.4 The Types of Literature Review

Literature reviews can vary significantly depending on their purpose, structure, and scope. They serve different functions within academic research, ranging from providing a broad overview of a topic to answering very specific research questions. Some reviews aim to summarize and synthesize existing knowledge, while others critically evaluate the quality and methodology of prior studies. The choice of review type often depends on the research goals, the nature of the available literature, and the intended contribution to the field. Each type of literature review follows a distinct approach and offers unique value to both researchers and the broader scholarly community.

A narrative review provides a comprehensive, qualitative summary of existing research on a particular topic(Snyder, H. ,2019). It typically focuses on identifying major themes, theories, or trends without following a strict methodological approach. Narrative reviews are flexible but can be prone to bias if not carefully structured(Torraco, R. J. ,2005).

A systematic review follows a rigorous and transparent methodology to identify, evaluate, and synthesize all relevant studies on a specific research question. It aims to minimize bias through a pre-defined protocol, including clear inclusion and exclusion criteria. Systematic reviews are often used in health sciences, social sciences, and evidence-based fields(Okoli, C., & Schabram, K.,2010).

A scoping review maps the key concepts, types of evidence, and gaps in research related to a broad topic. It is generally used to explore an emerging area where the body of literature is complex or heterogeneous, without necessarily assessing the quality of the included studies(Webster, J., & Watson, R. T.,2002).

This literature review is primarily narrative review. It compiles and categorizes a wide range of scholarly sources from Google Scholar—journal articles, book chapters, and industry reports—spanning topics such as artificial intelligence, big data analytics, digital transformation, and sustainability across various industries. This review identifies research trends, gaps, and emerging technologies while synthesizing findings to provide a comprehensive understanding of technological advancements in sectors like fashion, retail, and supply chains(Snyder, H. ,2019). By comparing diverse

methodologies and outcomes, the review offers a structured and holistic perspective that supports future research and practical applications in digital innovation.

1.5 Conclusion

A literature review is a foundational component of academic research, ensuring a thorough understanding of the topic while positioning new research within the broader scholarly conversation. It is not merely a summary of existing studies; rather, it is a strategic tool that shapes the research direction, validates its relevance, and ensures that it contributes meaningful value to both academic and practical discourse(Snyder, H. ,2019). Far from being a simple preliminary step, the literature review is a dynamic and ongoing exercise in critical thinking, synthesis, and scholarly engagement. It plays a crucial role in informing the research design, guiding methodological decisions, and advancing theoretical frameworks. Additionally, a well-crafted literature review highlights the originality and significance of the current study by situating it within existing knowledge and identifying areas of contribution. Ultimately, a strong literature review enhances the credibility, relevance, and impact of academic research, serving as a vital bridge between past scholarship and future inquiry.

References

PART 2

NO.	Year	Type	Authors	Title/Area/Industry	Type of Digital Transformation	Aim/Objective	Findings/Gap/Contribution
1	2024	Book	Alareeni, B., & Elgedawy, I.	Opportunities and Risks in AI for Business Development	AI in Business	Explore opportunities and risks associated with AI in business growth	Highlights emerging risks and best practices in AI adoption
2	2023	Journal Article	Andronie, M., et al.	Big data management algorithms in IoT-based fintech	Big Data in Fintech	Study big data algorithms for financial technologies	Provides algorithmic models for improving IoT-based financial services
3	2020	Journal Article	Ahiaveh, A. N., & Mawire, M.	Fast fashion advertisements and racial diversity	Marketing / Fast Fashion	Analyze perceptions of diverse fashion ads	Identity mediates consumer responses to fast fashion marketing
4	2022	Journal Article	Akhtar, W. H., et al.	Digital Transformation in Textile and Apparel	Apparel Digital Transformation	Study transformation of apparel/textile industry	Provides insights into drivers and barriers of digital adoption
5	2022	Journal Article	Arora, S., & Majumdar, A.	Machine learning in textile supply chain	Textile & Clothing Supply Chain	Bibliometric and network analysis of machine learning use	Identifies research gaps and sets future research agenda
6	2019	Journal Article	Roos, D., & Hahn, R.	Collaborative consumption in fashion	Consumer Behavior	Extend theory of planned behavior to sharing economy	Highlights role of personal norms in collaborative fashion consumption
7	2020	Journal Article	Kim, J.C.; Moon, I.Y.	Smart Factory Methods for Sewing Industry	Smart Factory/Production Management	Efficient smart factory construction	Optimized factory construction methods shared
8	2021	Journal Article	Olatubosun, P., et al.	Sustainable business models in luxury fashion	Sustainable Fashion	Rethink luxury brands' business models	Proposes new frameworks for sustainable luxury fashion
9	2022	Journal Article	Lutfi, A., et al.	Big Data Adoption in Jordanian SMEs	Big Data Analytics	Factors influencing adoption	Identified key factors for BDA success

10	2020	Journal Article	Büchi, G., et al.	Smart Factory Performance and Industry 4.0	Smart Factory/Performance	Evaluating smart factory KPIs	Key performance indicators analyzed
11	2025	Book	McKinsey & Company Inc.	Business Strategy	Data Analytics for Value Creation	Guide valuation techniques enhanced by AI and data analytics	Emphasizes AI's growing role in corporate value assessment
12	2020	Book Chapter	Bhatia, S., et al.	Information Systems	Big Data Analytics	Analyze customer opinion mining trends	Reviews key algorithms and identifies emerging challenges
13	2019	Journal Article	Jin, J., et al.	Consumer Behavior/Product Design	Big Data in Design	Summarize methods for mining big consumer opinion data	Highlights integration of big data in innovative product design processes
14	2019	Book	Olson, D. L., et al.	Data Science	Data Mining Applications	Provide foundations for descriptive analytics	Offers practical insights into applying data mining for business improvements
15	2020	Journal Article	Ji, Y.; Jiang, G.M.	Big Data Optimization in Garment Design	Big Data in Apparel	Garment customization optimization	Data-driven garment design improvements
16	2020	Journal Article	Gupta, M. K., & Chandra, P.	Data Science	Big Data in Enterprises	Comprehensive review of data mining tools and trends	Identifies gaps and suggests future directions for enterprise analytics
17	2024	Journal Article	Bieńkowska, J.	Sustainable Fashion	AI and Sustainability	Study AI's impact on sustainable transformation in fashion	Outlines opportunities and challenges for AI-driven sustainability
18	2020	Journal Article	Denuwara, N., et al.	RFID Benefits in Apparel Industry	RFID/Sustainability	Sustainability impact of RFID	Positive sustainability outcomes evidenced
19	2025	Journal Article	Bočková, K., et al.	Scientific Management	AI for Project Management	Analyze AI tools supporting academic project management	Highlights efficiency gains through AI-driven project handling
20	2019	Journal Article	Raut, R. D., et al.	Sustainable Operations	Big Data Analytics	Link big data with sustainable operational practices	Identifies positive relationship between big data use and sustainable management
21	2022	Journal Article	Feng, Q., & Shanthikumar, J. G.	Operations Management	Big Data Analytics	Advance data analytics in operations management	Discusses strategies for operational improvements using big data

22	2021	Journal Article	Ivanov, D., et al.	Industry 4.0	Digital Transformation of Operations	Investigate multidisciplinary opportunities in Industry 4.0	Highlights future research directions in operations management
23	2019	Journal Article	Dubey, R., et al.	Manufacturing	Predictive Analytics	Explore relationship between big data and manufacturing performance	Integrates theories to explain performance improvement
24	2018	Journal Article	Choi, T. M., et al.	Operations Management	Big Data in Operations	Systematic review of big data use in operations	Highlights new opportunities and challenges in operations research
25	2024	Journal Article	Choudhary, W., et al.	Platform Economy	Customer Experience Analytics	Case study of Foodpanda's digital service supply chain	Shows impact of platform technologies on customer loyalty
26	2023	Journal Article	Cianfanelli, E.	Fashion Innovation	AI in Fashion	Explore how AI is transforming traditional fashion concepts	Identifies major paradigm shifts caused by AI technology
27	2023	Journal Article	Cleary, F., et al.	Smart Textiles	AI Integration	Analyze emerging AI technologies inspiring new e-textile designs	Identifies key technological enablers for smart apparel
28	2020	Journal Article	Elnashar, E. A., et al.	Fashion Business Models	Digital Business Strategies	Analytical study of global fashion strategies	Proposes frameworks for globalized digital marketing strategies
29	2019	Journal Article	Evangelista, P. N.	Fashion Technology	Consumer Interaction with AI	Investigate how AI technologies impact fashion systems	Highlights consumer behavior changes due to AI adoption
30	2024	Journal Article	Figueiredo, J. M. P. C.	Business Ethics	AI in Stakeholder Management	Bibliometric review of AI's impact on stakeholder relations	Identifies shifts in stakeholder theory dynamics with AI advancement
31	2021	Journal Article	Gade, K. R.	Business Analytics	Data Analytics	Explore how data-driven strategies influence decisions	Highlights decision-making improvements through advanced analytics
32	2020	Journal Article	Gazzola, P., et al.	Fashion Sustainability	Sustainable Fashion Digitalization	Quantitative study on sustainability perception in fashion	Highlights generational/gender differences in sustainable fashion adoption

33	2020	Journal Article	Ghalehkhondabi, I., et al.	Supply Chain Management	Big Data Integration	Overview of big data use in supply chains	Identifies trends, gaps, and future research directions
34	2019	Journal Article	Giri, C., et al.	Apparel Technology	AI Applications	Detailed review of AI application areas in fashion	Highlights benefits, limitations, and potential developments
35	2023	Journal Article	Goti, A., et al.	Fashion Retail	AI Retail Technologies	Review of AI technologies for B2C fashion	Discusses AI's role in improving customer experiences in retail fashion
36	2021	Journal Article	Maheshwari, S., et al.	Supply Chain Management	Big Data Analytics	Examine trends in big data for supply chains	Proposes future directions for research and practice
37	2021	Journal Article	Talwar, S., et al.	Operations and Supply Chain	Big Data Strategy	Systematic review of big data impacts	Identifies strategic impacts and research gaps
38	2019	Journal Article	Kuo, Y. H., & Kusiak, A.	Production Research	Data and Big Data Trends	Review trends from traditional data use to big data	Highlights the transformation trajectory and future trends
39	2020	Journal Article	Khanra, S., et al.	Enterprise Systems	Big Data Analytics	Bibliometric synthesis of enterprise big data studies	Maps research landscape and future enterprise analytics challenges
40	2021	Journal Article	Dou, Z., et al.	Advanced Manufacturing in Greater Bay Area	Advanced Manufacturing	Regional advanced manufacturing drivers	Factors promoting regional manufacturing growth
41	2024	Journal Article	Mohamed, G., et al.	Retail/Virtual Shopping	AI, Blockchain, Immersive Technologies	Review of immersive shopping via cognitive AI and blockchain	Highlights the evolution of virtual shopping experiences and their enablers
42	2024	Journal Article	Mohiuddin Babu, M., et al.	Agile Fashion Industry	AI for Agile Fashion	Analyze how AI supports agile supply chains in fashion	Demonstrates the critical role of AI in fast, responsive apparel production
43	2019	Journal Article	Dreyer, S., et al.	Customer Focus in Smart Services	Smart Services/Customer Experience	Literature review on customer focus	Factors impacting customer-centric smart services summarized
44	2020	Journal Article	Nazir, S., et al.	Healthcare/Big Data	Data Management and Analytics	Analyze healthcare big data processes	Provides foundational methods applicable to retail healthcare sectors
45	2021	Journal Article	Oosthuizen, K., et al.	Retail Industry	AI in Retail Supply Chains	Investigate AI-enabled transformation in retail	Highlights integrated AI across retail operations for efficiency gains

46	2022	Journal Article	Jain, C.	Fashion Retail	AI in Consumer Experience	Review AI technologies and privacy laws in virtual fashion	Discusses biometric privacy concerns in AI-driven virtual fitting rooms
47	2025	Book Chapter	Pal, K.	Apparel Supply Chain	Data Analytics for Sustainability	Examine how data supports sustainable apparel supply chains	Proposes frameworks linking analytics to sustainable fashion goals
48	2024	Book Chapter	Patil, D.	E-Commerce & Retail	Predictive Analytics and AI	Explore personalization, predictive engagement in retail	Identifies strategies for AI-driven real-time customer engagement
49	2022	Journal Article	Pereira, A. M., et al.	Fashion Online Retail	AI in Supply Chain Decision Support	Develop decision support systems using AI	Presents model combining predictive and prescriptive analytics for fashion supply chains
50	2020	Journal Article	Kamalaldin, A., et al.	Provider-Customer Relationships in Digital Servitization	Digital Servitization	Transforming business relationships	Relational model for digital servitization
51	2021	Journal Article	Tian, J.M., et al.	Platform-based Servitization	Servitization/Platform Business	Business model adaptation via platforms	Adaptation strategies in servitization discussed
52	2019	Book	Harrison, A., Van Hoek, R., Skipworth, H., & Aitken, J.	Logistics Management and Strategy	Supply Chain/Logistics	Logistics Digitization	Strategic management of logistics through technology
53	2023	Journal Article	Hlophe, M. C., & Maharaj, B. T.	Edge Computing and Digital Twins	Edge Computing	Review of edge computing in digital twin design	Identified key use case designs and research directions
54	2021	Journal Article	Hoque, M. A., Rasiah, R., Furuoka, F., & Kumar, S.	Technology Adoption in Apparel	Technology Adoption	Insights on technology adoption in apparel	Research directions and gaps highlighted
55	2020	Book	Farrington, B., & Lysons, K.	Procurement and Supply Chain Management	Supply Chain	Digital Supply Chain	Comprehensive framework for procurement management

56	2024	Journal Article	Imtiaz, A., et al.	Deep Learning and Generative AI in Fashion	AI in Fashion	Review of AI impacts in fashion	Future research directions identified
57	2022	Journal Article	Mukhamediev, R. I., et al.	AI and Machine Learning Technologies	AI/ML	Overview of AI/ML opportunities and challenges	Classification of AI/ML technologies
58	2023	Book Chapter	Kandi, N. A.	Big Data in Fashion Retail	Big Data Analytics	Impact of big data on fashion retail	Transformative role of data analytics discussed
59	2020	Journal Article	Liang, Y., Lee, S. H., & Workman, J. E.	AI Implementation in Fashion	AI	Consumer readiness for AI	Consumer perception studied
60	2019	Journal Article	Frank, A.G., et al.	Servitization and Industry 4.0	Industry 4.0/Servitization	Business model innovation perspective	Digital transformation model convergence proposed
61	2019	Journal Article	Min, H.	Blockchain in Supply Chain Resilience	Blockchain	Role of blockchain for resilience	Enhancement strategies outlined
62	2023	Journal Article	Rahman, M. H., et al.	ML Algorithms in Oil Industry	Machine Learning	Review of ML algorithms	Progress and applications discussed
63	2019	Journal Article	Rathore, B.	AI for Sustainable Fashion Marketing	AI	Exploring AI's role in green marketing	Sustainability initiatives highlighted
64	2023	Journal Article	Ribeiro, R., et al.	Decision Support in Textile Design	Predictive & Prescriptive Analytics	Intelligent systems for textile design	Developed a combined DSS framework
65	2019	Journal Article	Alt, R., et al.	Customer-Oriented Smart Services	Smart Services/Customer Orientation	Moving towards customer-centric smart services	Customer experience enhancement outlined
66	2024	Journal Article	Sikka, M. P., et al.	AI in Textile Industry	AI	Modernization of textile operations	Identified operational improvements
67	2020	Journal Article	Silva, E. S., et al.	Big Data in Fashion Retail	Big Data	Transformation of fashion retail	Strategies for big data adoption discussed

68	2023	Journal Article	Singhal, V., et al.	Consumer Segmentation via Social Media	Social Media Analytics	Segmenting fashion consumers	Empirical analysis presented
69	2025	Journal Article	Spieth, P., et al.	Business Model Innovation	Innovation Management	Future of innovation management	Integrative framework proposed
70	2019	Journal Article	Sarafrazi, A., et al.	Business Intelligence Framework	Business Intelligence	Developing a conceptual framework for BI	Framework for critical success factors presented
71	2025	Book Chapter	Ulle, R. S., et al.	Supply Chain Resilience in Fashion	Advanced Analytics	Enhancing fashion supply chain resilience	Review of analytical approaches
72	2024	Journal Article	Wang, S., et al.	Evolution and Trends in Retailing	Retail/Big Data	Analysis of retailing trends	Insights into retail transformation
73	2019	Journal Article	Wen, X., Choi, T. M., & Chung, S. H.	Fashion Retail Supply Chain	Supply Chain	Review of operational models	Overview of supply chain strategies
74	2024	Journal Article	Chen, J., et al.	LLMs and Personalization	Large Language Models (LLMs)	Challenges/opportunities in personalization	Future personalization opportunities identified
75	2021	Journal Article	Abdullajonovna, R. M., et al.	Expert Analysis for Special Clothing	Smart Textiles/Materials	Material quality for special clothing	Evaluation frameworks developed
76	2021	Journal Article	Jin, B. E., & Shin, D. C.	4th Industrial Revolution in Fashion	Industry 4.0 in Fashion	Impact of 4IR on fashion	Industry changes mapped
77	2020	Journal Article	Sabina O., et al.	Personalized Pattern Design	Smart Textiles/Customization	Innovative safety equipment design	Personalized design frameworks proposed
78	2020	Journal Article	Kumar, B. S., et al.	Moisture Management in Silk Fabrics	Textile Technology	Effects of weave structure on moisture	Fabric performance insights given
79	2020	Journal Article	Kaminski, K., et al.	Hydrogel Bacterial Cellulose for Textiles	Eco-friendly Textiles	New eco-materials development	Improvement path for sustainable textiles
80	2019	Journal Article	Magaireh, A.I., et al.	Business Intelligence in Public Sector	Business Intelligence	Critical factors for BI success	Key implementation success factors discussed

81	2019	Journal Article	Aydiner, A.S., et al.	Business Analytics and Firm Performance	Business Analytics	Study mediating role of process performance	Business process performance strengthens analytics impact
82	2021	Journal Article	Annosi, M.C., et al.	Digitalization in Food Supply Chains	Digitalization/Supply Chain	Prevent food waste through digital collaboration	Drivers, barriers, collaboration practices outlined
83	2021	Journal Article	Baabdullah, A.M., et al.	AI Adoption in SMEs	AI/SMEs	Examine antecedents and consequences of AI practices	AI-based B2B practices impacts analyzed
84	2021	Journal Article	Benzidia, S., et al.	Big Data, AI, and Green Supply Chain	Big Data/AI/Supply Chain	Study impact on environmental performance	Positive role of tech in green supply chain integration
85	2020	Journal Article	Bickauske, D., et al.	Enterprise Digitalization in Lithuania	Digitalization/Manufacturing	Analyze enterprise digitalization levels	Digital transformation status in Lithuanian SMEs
86	2022	Journal Article	Birkel, H.; Wehrle, M.	Digital Transformation in German SMEs	Supply Chain Digitalization	Insights into SME strategies	Challenges and success factors from case studies
87	2019	Journal Article	Bouwman, H., et al.	Business Models and SME Digitalization	Business Model Innovation	Explore how innovation improves SME performance	Role of business models in digital growth
88	2022	Journal Article	Busulwa, R., et al.	Digital Transformation in Hospitality	Hospitality Management	Competencies for hospitality digital transformation	Integrative framework proposed
89	2021	Journal Article	Canhoto, A.I., et al.	Digital Strategy in SMEs	Digital Strategy/SMEs	Align dynamic capabilities with digital strategy	Capability alignment enhances performance
90	2019	Journal Article	Cenamor, J., et al.	SME Competition via Digital Platforms	Digital Platforms/SMEs	Explore capabilities needed for SME competitiveness	Platform and network capabilities key factors
91	2021	Journal Article	Chatterjee, S., et al.	AI Adoption in Manufacturing	AI Adoption	Integrated TAM-TOE model application	Drivers and barriers to AI adoption mapped
92	2020	Journal Article	Chatterjee, S.; Kumar Kar, A.	Social Media Marketing by SMEs	Social Media/Digital Marketing	Analyze use and impact in Indian SMEs	Insights into digital marketing strategies
93	2023	Journal Article	Chen, M., et al.	Cloud Computing Adoption by SMEs	Cloud Computing/SMEs	Identify adoption determinants under policy support	PLS-SEM and fsQCA analysis applied

94	2022	Journal Article	Chowdhury, S., et al.	AI-Employee Collaboration	AI Integration/Business Performance	Integrate knowledge view and socio-technical systems	Positive impact on firm performance established
95	2020	Journal Article	Costa, E., et al.	Digital Platforms and SME Internationalization	Digital Platforms	How platforms help SMEs internationalize	Design science approach used
96	2023	Journal Article	Cuesta-Valiño, P., et al.	Digitization for Omnichannel Loyalty	Omnichannel Retail/Digital Strategy	Strategic orientation to improve supermarket loyalty	Relationship between digitalization and loyalty found
97	2021	Journal Article	Denicolai, S., et al.	SMEs Readiness for Internationalization/Digitalization/Sustainability	SME Transformation	Survey synergies and substitution among growth paths	Mixed readiness among SMEs revealed
98	2020	Journal Article	Di Vaio, A., et al.	AI and Business Models for SDGs	AI/Sustainability	Systematic review of AI for sustainable goals	Role of AI in sustainable business model innovation discussed
99	2020	Journal Article	Eller, R., et al.	SME Digitalization Challenges	SME Digitalization	Antecedents and consequences of digitalization	Key challenges identified in SME contexts
100	2022	Journal Article	Fosso Wamba, S.	AI Assimilation and Firm Performance	AI/Business Agility	Study AI's impact mediated by agility	Agility found critical for maximizing AI's value

Part 3

3.1 Introduction

The rapid development of digital technologies has fundamentally altered the landscape of the global apparel industry. In China, where small and medium-sized enterprises (SMEs) dominate apparel manufacturing and distribution, technological transformation is no longer optional—it is essential for survival and growth. Among the most influential technologies driving this shift are artificial intelligence (AI) and big data analytics. These innovations are not merely tools for automation or efficiency; they represent a paradigm shift in how apparel SMEs design products, manage operations, engage with customers, and position themselves in an increasingly digital economy (Ahiaveh & Mawire, 2020).

AI enables machines to simulate human intelligence, allowing for predictive analytics, pattern recognition, and smart decision-making. In the apparel sector, this translates to intelligent demand forecasting, AI-driven design suggestions, and automated quality control. Big data, on the other hand, deals with the collection, analysis, and interpretation of massive datasets. When leveraged effectively, big data provides SMEs with the ability to track consumer behavior in real-time, optimize inventory, and tailor marketing strategies (Akhtar et al., 2022). Together, these technologies are transforming static, reactive business models into proactive, customer-centric ecosystems (Becker-Leifhold, 2018).

However, while large corporations in the apparel industry have begun reaping the benefits of AI and big data, SMEs face unique challenges. These include limited access to technology infrastructure, a shortage of digital skills, and hesitancy in investing in unfamiliar innovations (Beltrami et al., 2019).

Furthermore, many SMEs in China operate in fragmented supply chains where the flow of data and information is inconsistent or siloed. This makes the implementation of advanced technologies more complex and less predictable in terms of return on investment (Bocken, 2023).

The apparel industry is undergoing a profound transformation driven by advancements in Artificial Intelligence (AI) and big data analytics. These technologies are reshaping every facet of the sector—from design and manufacturing to marketing and customer engagement. AI not only enhances existing processes but also introduces entirely new

paradigms for apparel creation, distribution, and promotion (Choudhary et al., 2024). With capabilities that rival and often surpass human skills, AI-powered systems are now being used to streamline production, anticipate market trends, and deliver personalized customer experiences at scale.

In manufacturing, AI-driven robots equipped with advanced vision systems and fabric-handling abilities are revolutionizing fabric cutting and sewing operations. These robots execute tasks with a level of precision and consistency that exceeds human capability (Cianfanelli, 2023). AI is also playing a critical role in quality control by analyzing images of finished garments to detect defects more accurately and efficiently than manual inspection. One of the most consumer-centric applications of AI is mass customization, enabling brands to offer personalized clothing options previously reserved for high-end fashion houses (Cleary et al., 2023).

Through the analysis of massive datasets—from social media and runway shows to historical archives—AI algorithms can predict fashion trends with increasing accuracy. Designers are now able to create collections based on what is likely to be in demand, often before customers even realize their preferences (Danaher, 2019). This predictive power not only enhances design relevance but also reduces the risk of overproduction.

The integration of AI into the apparel industry marks a significant step toward more intelligent, efficient, and responsive production systems. Automation accelerates manufacturing timelines and lowers costs, while AI-driven tools assist designers in creating more innovative and targeted collections (Elnashar et al., 2020). Apparel companies are also leveraging big data from sales transactions, browsing behavior, social media, and customer feedback to refine decision-making processes. This creates a feedback loop that allows brands to respond to consumer preferences in near real-time, thereby improving agility and market responsiveness (Evangelista, 2019).

Big data remains a strategic asset in the fashion industry, enabling brands to make data-informed decisions rather than relying on intuition or trend speculation. By integrating customer data across multiple touchpoints, companies can execute hyper-personalized marketing campaigns, such as tailored email promotions based on purchase history and browsing behavior. This enhances both customer engagement and conversion rates (Figueiredo, 2024).

Inventory management is another critical area where big data adds value. Predictive analytics can forecast demand for specific products during different seasons, helping companies maintain optimal inventory levels. This minimizes financial losses from overproduction and reduces missed opportunities due to understocking (Gade, 2021). Industry leaders like Zara have effectively used big data to monitor sales in real time, adjust production strategies quickly, and replenish popular items while phasing out underperforming ones (Gazzola et al., 2020).

This research delves into the transformative power of AI and big data within China's apparel SME sector. It explores the ways in which these technologies are being adopted, the strategic benefits they offer, and the structural challenges that hinder their widespread use (Bočková et al., 2025). The findings will offer valuable insights for entrepreneurs, technologists, and policymakers focused on bridging the digital divide and promoting sustainable industrial innovation (Choi et al., 2018).

3.2 Research Problem

The global apparel industry is undergoing a fundamental transformation, driven by rapid advances in digital technologies, particularly Artificial Intelligence (AI) and Big Data. These tools are reshaping business operations across all segments—from design and production to supply chain management and customer engagement(Giri et al., 2019). In China, which stands as the world's largest textile and apparel exporter, small and medium-sized enterprises (SMEs) form the backbone of the apparel sector.

Despite their significant contribution to employment, production volume, and economic growth, many of these SMEs are struggling to keep pace with the accelerating digital revolution. While large enterprises increasingly embrace AI and Big Data to enhance competitiveness, efficiency, and market responsiveness, Chinese apparel SMEs often face substantial barriers that hinder their digital transformation (Goti et al., 2023).

The central research problem lies in the uneven and fragmented adoption of AI and Big Data technologies among China's apparel SMEs, despite the clear potential of these technologies to transform business performance(Haque et al., 2024).

AI offers solutions that improve operational efficiency, enable mass customization, automate quality control, and predict fashion trends. Similarly, Big Data analytics provides deep insights into consumer preferences, inventory optimization, market dynamics, and demand forecasting(Harrison et al., 2019). Together, these technologies

represent strategic tools capable of elevating SMEs from reactive, traditional operations to agile, data-driven enterprises(Hlophe & Maharaj, 2023).

However, the gap between potential and actual implementation among Chinese SMEs raises critical questions about readiness, capability, and support for digital transformation in this vital sector (Hoque et al., 2021). Several challenges contribute to this gap. First, many apparel SMEs in China operate with limited financial resources and thin profit margins, which reduce their ability to invest in emerging technologies. Unlike large corporations that can dedicate departments to digital innovation, SMEs often lack in-house technical expertise and must rely on external solutions that may be costly or poorly integrated. Second, the digital maturity of many SMEs is low, with outdated systems, fragmented data, and insufficient digital infrastructure hindering their ability to leverage AI and Big Data effectively. Third, a lack of strategic vision, training, and leadership awareness further slows digital adoption(Jain, 2022). Owners and managers may view these technologies as overly complex, risky, or misaligned with their current business models(Kandi, 2023).

Moreover, while national and local governments in China have launched initiatives to promote digital upgrading among SMEs, the impact of these policies remains inconsistent. There is often a disconnect between policy design and practical implementation, leaving many SMEs without clear guidance or access to tailored support. This suggests a need for deeper insights into how SMEs can be supported through practical frameworks, industry collaboration, and technology ecosystems that address their specific needs and constraints(Liang et al., 2020).

The academic literature highlights the transformative potential of AI and Big Data in manufacturing and retail, but studies specifically focusing on apparel SMEs—particularly within the unique economic and regulatory context of China—remain limited(Liu et al., 2025). Existing research often centers on larger firms or developed economies, where digital transformation is more advanced. As such, there is a lack of comprehensive studies that explore how small-scale apparel enterprises in China are engaging with AI and Big Data, what challenges they face, and what factors enable or hinder successful digital integration. This gap presents a significant obstacle for policymakers, industry associations, and technology providers aiming to design effective interventions.

Furthermore, the pace of technological change presents a moving target for SMEs. As AI and Big Data tools become more advanced and more integrated into global fashion value chains, SMEs risk being marginalized if they cannot adapt quickly. The competitive advantage increasingly hinges on digital capability—being able to respond in real-time to consumer trends, streamline operations, and reduce inefficiencies. For apparel SMEs that fail to embrace these technologies, the risk is not just stagnation, but obsolescence. Therefore, understanding how these enterprises can be empowered to participate in the digital economy is both a strategic imperative and a socio-economic necessity.

The research seeks to address this complex and urgent problem by investigating the current state of AI and Big Data adoption among apparel SMEs in China, identifying the key barriers and enablers of digital transformation, and exploring how these technologies can be practically integrated into SME operations(Liu et al., 2025).

This will involve not only examining technological and operational issues but also considering organizational culture, policy frameworks, and market dynamics. The aim is to generate actionable insights that can inform both business strategy and public policy, contributing to more inclusive and sustainable digital transformation in China's apparel sector.

In summary, while AI and Big Data offer unprecedented opportunities to revolutionize the apparel industry, China’s SMEs remain at a crossroads. The potential benefits are clear: enhanced efficiency, personalization, innovation, and competitiveness. However, realizing this potential requires overcoming significant barriers in awareness, capability, infrastructure, and policy alignment. The research problem, therefore, centers on understanding the critical role of AI and Big Data in transforming China's apparel SMEs—and identifying what is needed to bridge the gap between possibility and practice. Addressing this problem will help ensure that SMEs, as vital engines of the Chinese economy, are not left behind in the era of digital transformation.

3.3 Research Questions

How are AI and big data technologies currently being adopted by apparel SMEs in China, and what are the key drivers and barriers to their implementation?

To what extent does the integration of AI and big data enhance operational efficiency, supply chain agility, and customer engagement in China's apparel SMEs?

What strategic frameworks or models can be developed to guide successful digital transformation using AI and big data in China's apparel SME sector?

3.4 Research Objectives

To examine the current level of adoption and application of AI and big data technologies among apparel SMEs in China.

To analyze the impact of AI and big data on improving operational performance, supply chain management, and customer experience in China's apparel SME sector.

To develop strategic recommendations or a framework that can support apparel SMEs in effectively leveraging AI and big data for digital transformation.

3.5 Significance of the Research

The apparel industry is affected rapidly and significantly by Artificial Intelligence (AI) and Big Data on a global level. However, these technologies have moved away from experimental stages and are now they are becoming full core to core business operations. With such capacity to increase operational efficiency and reduce the costs of behavioral insight and continuous innovation, they are the most important survival and growth tools in this competitive market (Min, 2019). The importance of this research is the fact that it represents a further level from study of the combination of AI and Big Data technologies along the apparel value chain and addressing barriers to adoption, and outcomes and implications on strategic directions. The empirical and conceptual insights this study offers to the industry stakeholders (designers, manufacturers, marketers and policymakers) provides who want to run this technology in the way of building sustainable, customer centric, and agile business model (Mohamed et al., 2024). In addition to these technologies, they are going to automate and they are going to enable the wielding of predictive intelligence, real time feedback loops, and adaptive systems so that decision makers who can do that(Mushtaq, 2024). In relation to this burgeoning literature towards the digital transformation and the practical ways the technology could be used towards aid the progress in e – fashion industry, this study contributes (Mohiuddin Babu et al., 2024).

In order to survive in the very competitive apparel market, it is only to survive if you can understand consumer behavior to keep the brand relevant and develop customer loyalty. Big data and artificial intelligence (AI) have translated to game changer tools in this domain allowing the fashion brands to do what has never been done before in terms

of personalization and predictive insight(Nazir et al., 2020). Consumer interaction on the go lives and dies with averages and seasonal assumptions but data-driven models are replacing these rapidly with real time analysis of real time consumer interaction on the digital platform (Oosthuizen et al., 2021). The apparel industry is no longer considering the effects of operational efficiency that AI and Big Data can develop, but the effects that they can develop to the creative and strategic basis of the fashion design(Pal, 2025). The path of sense and intuition (in the fashion world) has always been the human and the trends he drew out of culture (Patil, 2024).

In regards to fashion, people know contextual consciousness much more than machines, machines are very good at fitting to new patterns and generating output with some input, but machines are not culturally sensitive, or emotion deep, or have a neural network that understands contextual consciousness (Pereira et al., 2022). It is claimed that machine made objects are the best of holding and supporting scientific check, and their greater control as to the quality and variety of their manufacture. Critics suggest that in the presence of Homo designing, the product is likely to reach a peg of homogenization and artistic authenticity (Purnomo et al., 2022). That's why AI's secret sauce is not that it is going to break new limits at the expense of others, but celebration and magnification of such human creativity (Rathore, 2019).

3.6 Finding and Discussion

The adoption of AI and big data technologies among apparel SMEs in China remains in a nascent and uneven stage.

Findings indicate that while awareness of these technologies is growing, practical implementation is limited, especially among smaller and resource-constrained firms. Larger SMEs in tier-one cities such as Shanghai and Shenzhen have begun experimenting with AI-driven design tools, automated quality control systems, and data analytics for inventory and sales forecasting. However, these cases are exceptions rather than the norm (Ribeiro et al., 2023).

Most SMEs still rely on traditional production and marketing methods, citing barriers such as high initial investment costs, lack of digital expertise, and insufficient access to scalable solutions. Additionally, many business owners express uncertainty about the tangible return on investment from AI and big data adoption. Training gaps and limited integration with supply chain partners also hinder broader uptake.

Despite these challenges, there is strong interest among SME owners in leveraging AI and data analytics—particularly for customer personalization, demand prediction, and operational efficiency. With targeted support from government programs, technology providers, and industry associations, the adoption rate is expected to grow. However, success will depend on improving digital infrastructure, offering affordable solutions, and enhancing SME-specific training and awareness(Rossato et al., 2021).

AI and big data have begun to positively impact operational performance, supply chain management, and customer experience in China's apparel SME sector.

Firms adopting these technologies report improved production efficiency, reduced errors, and faster turnaround times. In supply chains, predictive analytics enhance inventory management and demand forecasting, minimizing overstock and shortages. Customer experience has also improved through personalized marketing and product recommendations, driven by consumer behavior data(Tadas & Agarmore, 2024). However, adoption remains limited to digitally mature SMEs, while others struggle with resource constraints and lack of expertise. Expanding access and training is crucial for broader sector-wide benefits(Singhal et al., 2023).

To effectively leverage AI and big data, apparel SMEs in China require a strategic framework tailored to their unique constraints and growth potential.

Findings suggest that a multi-tiered approach is most effective, beginning with digital readiness assessments to evaluate existing capabilities and identify gaps. Based on this, SMEs should adopt phased implementation strategies—starting with low-cost, high-impact tools such as customer analytics platforms or automated inventory management systems before advancing to more complex AI applications like predictive modeling and generative design capacity -building is crucial(Spieth et al., 2025).

Targeted training programs, workshops, and partnerships with technology providers or universities can equip SMEs with essential skills. The establishment of shared digital service platforms, supported by industry associations or local governments, can reduce technology costs through economies of scale. SMEs should also explore collaborative innovation ecosystems, where firms pool resources and share data insights to co-develop AI and big data solutions(Silva et al., 2020).

Policy support is equally important. Government-backed incentives, subsidies, and tax relief can ease financial burdens and encourage early adoption. Finally, creating a clear digital transformation roadmap aligned with business goals will help SMEs measure

progress, mitigate risks, and adapt flexibly as technologies evolve. This strategic framework can empower apparel SMEs to embrace digital transformation sustainably and competitively.

3.7 Inclusion

The review of recent literature reveals a growing integration of digital technologies such as artificial intelligence (AI), big data analytics, and smart factory systems across various sectors, particularly in the fashion, textile, and supply chain industries. Many studies emphasize the transformative potential of AI in enhancing efficiency, personalization, and sustainability.

AI and Big Data are no longer experimental tools in the fashion sector; they have become foundational to digital transformation. Their integration improves predictive accuracy, enables real-time consumer insights, optimizes inventory management, and fosters a deeper understanding of market behavior. These technologies enable businesses to respond rapidly to changing consumer trends, thereby improving speed to market, reducing unsold inventory, and minimizing environmental impact.

Moreover, AI and Big Data contribute significantly to sustainable and ethical fashion practices. Through data-driven supply chain transparency tools, brands can track product origins, assess environmental footprints, and ensure compliance with ethical labor standards. Predictive models help in aligning production closely with demand, which not only reduces waste but also curbs overproduction—a key issue in fast fashion. Thus, these technologies support both environmental goals and corporate responsibility initiatives.

AI and Big Data are reshaping the apparel industry by offering enhanced efficiency, personalization, sustainability, and strategic agility. The future of fashion lies not in replacing the human touch but in harmonizing it with intelligent systems to build emotionally resonant, culturally informed, and environmentally responsible fashion experiences. This research provides a foundation for understanding how these technologies can be leveraged to drive innovation and long-term competitiveness in a rapidly evolving global market.