Available online at www.HighTechJournal.org

HighTech and Innovation Journal

ISSN: 2723-9535

Vol. 7, No. 2, June, 2026

Social Media Integration and Enterprise Resource Dynamics: Pathways to MSE Adaptive Capabilities

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Received 12 May 2025; Revised 07 March 2026; Accepted 11 March 2026; Published 01 June 2026

Abstract

This study aims to investigate how social media embedding influences micro and small enterprises' (MSEs) adaptability through resource integration mechanisms in agricultural enterprises. The present research theoretical framework is based on resource-based, vocational ability development, and social media embedding theories. Its objective is to determine the influence of social media embedding on MSEs' adaptability. A convenience sampling survey gathered data from 327 small and micro agriculture-related entrepreneurs in China. According to the study results, both online community embedding and web media embedding had a significant and positive impact on MSEs. While web media embedding significantly affected resource integration, online community integration did not. Resource integration was identified as a mediating factor between the two dimensions of social media embedding (i.e., online community embedding and web media embedding) and the adaptability of entrepreneurial enterprises. This study advances existing literature by decomposing social media embedding into distinct dimensions. This decomposition offers a nuanced understanding of the differential impacts across various dimensions. The research establishes resource integration as a critical mechanism linking social media use to organizational adaptability. Furthermore, it extends resource-based theory application in the digital transformation context of agricultural MSEs. These findings offer practical implications for enhancing enterprise adaptability through social media utilization.

Keywords: Adaptability of MSEs; Social Media Embedding; Online Community Embedding; Web Media Embedding; Resource Integration.

1. Introduction

Over the years, the world has experienced diverse transformations. Technological advancements have triggered an industrial revolution, while market volatility has led to heightened uncertainty, complexity, and ambiguity, all driven by digital transformation [1]. Digital transformation is crucial for achieving sustainable development goals, driving economic and social progress in countries, and enhancing people's quality of life. This is achieved through equitable allocation of benefits, mitigation of unavoidable negative impacts, and fostering the development of residents' abilities. To successfully overcome these issues and achieve sustainable goals, companies must identify the primary catalysts of digital transformation [2]. To survive the digital revolution, companies must enhance their digital capabilities and strike a balance between their economic, environmental, and social impacts [3]. The agricultural sector faces food crises and substantial challenges in achieving green and sustainable development, with digital technology emerging as a crucial countermeasure [4]. Research has shown that the degree of regional digitalization has a significant impact on the improvement of agricultural total factor productivity in economically underdeveloped areas [5, 6]. Agriculture, innovation, services, and industry are four pivotal elements driving global economic growth, all of which are powered by digital technologies. Currently, agriculture is viewed as a significant component of value chains, offering valuable

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https://doi.org/10.28991/HIJ-2026-07-02-016

services to humanity, ensuring food safety, and strengthening and enhancing financial systems while prioritizing social, environmental, and economic sustainability [7]. The digital transformation of the agricultural industry has several advantages for micro and small agribusinesses, including enhanced agricultural efficiency, increased market transparency, and more cost-effective logistics [8]. Particularly in the context of the COVID-19 pandemic and its impact on public health, digital agriculture has helped agricultural operators mitigate adverse effects on sales, payments, and financing [9-11].

With the rapid changes in the global landscape, uncertainty is on the rise, and entrepreneurial activities face heightened risks, necessitating MSEs to possess greater dynamic adaptability in their business endeavors. Adaptability is a crucial aspect of an enterprise's dynamic capabilities, as it involves promptly adjusting business strategies in response to environmental changes, integrating internal and external resources through identifying, developing, and utilizing opportunities, and ultimately leading to better entrepreneurial performance [12-14]. The adaptability level directly impacts the survival and growth of MSEs, leading the academic community to consistently focus on researching the factors that influence the dynamic capabilities of entrepreneurial enterprises [15].

Numerous studies have demonstrated that information technology plays a crucial role in enhancing the dynamic capabilities of enterprises, particularly in managing small and medium-sized enterprises. Roberts & Campbell [16] argue that leveraging enterprise information systems facilitates business intelligence, analysis, and simulation, helping managers broaden their perspectives, identify valuable opportunities, and creatively combine diverse data sets to explore areas for organizational innovation and development. Siemon [17] asserts that information technology is among the organizational factors influencing the dynamic capabilities of enterprises. Organizations utilize IT to enhance their organizational structure and business processes, develop dynamic capabilities, differentiate themselves in the market, and ultimately create value. While existing studies often treat information technology as a vague and general variable, encompassing computers, communication technology, mobile phones, and e-commerce [18], it is important to note that present-day information technology has entered the mobile internet era, with social media serving as an essential tool for small and micro start-ups [19]. Entrepreneurs' use of social media has expanded beyond marketing to include business networking, information search, and corporate crowdfunding. Social media is crucial for enhancing company performance and driving innovation [20].

The study distinguishes between social media embedding, online community embedding, and web media embedding, with empirical research revealing significant positive effects of both dimensions on dynamic capabilities, marking an in-depth exploration in this domain. The research findings indicate that in social media, MSEs can enhance their adaptability through two distinct pathways: online community embedding and web media embedding. This, in turn, improves business decision-making, entrepreneurial learning, the development of new business models, and operating income within social media. Farmers, in particular, rely on social network relationships to carry out entrepreneurial activities [21]. Social media plays a significant role in community development. Farmers can develop additional customer and partner resources by utilizing social media [11]. Moreover, community interaction on social media, serving as an important platform for open innovation, can help farmers gather customer feedback, refine products and services, and adjust management measures for improved development [22]. By utilizing social media for mobile learning, farmers can access entrepreneurial information, enhance their dynamic capabilities, and achieve sustainable development by better adapting to changing environments [23]. However, there remains a scarcity of research on the correlation between social media and the dynamic capabilities of MSEs, preventing a complete understanding of the impact of the latest information technology tools on the dynamic adaptability of MSEs. Thus, this research examines the relationship between social media embedding and the adaptability of MSEs.

Researchers have discovered that social media contains a wealth of information, enabling influencers, communicators, and innovators to facilitate the integration of farmers' resources [19]. The impact of media technologies depends on their content (information versus entertainment), their effectiveness in fostering coordination, the networks they create, and individual characteristics and choices regarding media consumption [24]. Consequently, the ability to build network relationships, primarily through expanding heterogeneous networks, necessitates a stronger comprehensive ability. If the online community of MSEs primarily consists of familiar relatives and friends, they will primarily acquire combined social capital, resulting in limited access to heterogeneous social resources and a diminished impact on integration [25]. Scholars have traditionally focused more on the relationship between entrepreneurial ability, social networks, and resource integration in entrepreneurial enterprises. From the unique perspective of information technology, this research examines the key and challenging aspects of resource integration in entrepreneurial enterprises, effectively supplementing research on the early factors influencing resource integration. Therefore, this research examines the relationship between social media integration and resource allocation.

Furthermore, network media embedding effectively promotes the integration of enterprise resources, ultimately improving the adaptability of MSEs in a dynamic environment. This provides a practical pathway for MSEs to achieve sustainable development with the help of information technology [26]. However, at times, the limited impact of small and micro agriculture-related entrepreneurs' online community ability on resource integration, combined with the scarcity of resources, further affects the mediating role between online community embedding and enterprise adaptability [27]. Hence, this research aims to discover the mediating role of resource integration in the relationship between social media embedding and MSEs' adaptability.

This research contributes to theoretical advancement by examining the convergence of resource-based theory (RBT) [28], vocational ability development theory (VADT) [28], and social media embedding [29] perspectives in the context of MSEs' digital transformation. The theoretical framework demonstrates how RBT's focus on distinctive resource configurations complements VADT's organizational learning principles, while social media embedding theory provides mechanisms for digital integration. The interconnection of these theoretical perspectives reveals how social media embedding facilitates resource acquisition and capability development in MSEs. This theoretical synthesis illuminates the complex interplay between resource utilization, organizational learning, and digital integration processes. The framework extends current understanding of digital transformation in MSEs, particularly regarding the intersection of resource constraints, organizational learning, and digital capability development in contemporary business environments.

This research aims to address the following research gaps. Firstly, it aims to uncover the association between social media embedding and MSE's adaptability. Secondly, it examines the linkage between social media embedding and resource integration. Thirdly, it examines the impact of resource integration on the adaptability of MSEs. Lastly, it explores the mediating impact of resource integration on the relationship between social media embedding and MSE's adaptability. In summary, in the context of social media, improving the dynamic adaptability of small and micro start-ups relies on the interplay between social media embedding and resource integration. Therefore, building upon the RBT, VADT, and social media embedding theory, this study comprehensively considers the impact of online media embedding, online community embedding, and resource integration factors on the dynamic adaptability of MSEs, deepening our understanding of the distinct dimensions of social media embedding and the specific role of resource integration in MSEs' dynamic adaptability.

2. Theoretical Background

2.1. Agriculture (International Standard Industrial Classification (ISIC))

ISIC 4 is the fourth revision of the United Nations Industrial Classification System to classify industries. The classification of industries in ISIC is based on international agreements that govern policies, products, and definitions. Additionally, the classification of ISIC does not consider the legality of the industry's production or whether the industry is formal or informal. Therefore, according to the ISIC classification of agriculture, the economic activities related to forestry, fishing, and agriculture are categorized as agricultural economic activities [30].

The ISIC of agricultural activities reflects substantial methodological refinements in response to sectoral modernization [31, 32]. Contemporary agricultural classification frameworks acknowledge the intricate nature of value chains and the integration of food production systems. These frameworks now incorporate precise categorizations of agricultural operations, addressing aspects of biological asset management and technological integration. Such taxonomic developments serve as crucial instruments for policy formulation and comparative economic analysis in agriculture. The refined classification structure enables more precise cross-national comparisons and supports the development of evidence-based agricultural policies.

Furthermore, Industry 4.0, which encompasses innovative concepts such as the Internet of Things (IoT), is employed to describe Agriculture 4.0 [33, 34]. The agricultural industry can be traced back to Agriculture 1.0, which involved the use of animal power for agricultural activities. Next came Agriculture 2.0, which involved the introduction of mechanical engines for conducting agricultural activities. Agriculture 3.0 was characterized by the advent of more advanced GPS systems used in precision agricultural activities [35]. Currently, Agriculture 4.0 is associated with the use of cloud technology in agricultural activities. However, the next step, Agriculture 5.0, is closely related to the digitalization of agricultural activities through the use of artificial intelligence (AI) and robotics. Government and decision-makers are encouraged to promote these technologies in MSEs to help them stay up-to-date with technological advancements and remain competitive in the dynamic market environment [36].

2.2. Social Media

Social media can be defined as online platforms that allow users to create a social network and share experiences and knowledge [37]. Social media is a dynamic platform that has brought about three fundamental transformations in various industries [20]. The first fundamental transformation is related to the connectedness of customers and corporations. Connectedness can be enhanced through networking platforms like Facebook, content-sharing networks like YouTube, and blogging information networks like Twitter [37]. The concept of connectedness gave rise to the concept of social ties, which determine the duration and strength of social connectedness [38]. Previous research highlighted the role of strength in customer retention [39]. The second fundamental transformation is related to actions that impact how customers and corporations communicate [40]. These social actions are also known as word of mouth (WOM) [8]. It can be argued that these social interactions associated with the social network framework provide corporations with measurable social equity [38]. The third fundamental transformation is related to the management of large amounts of data generated by social media. Companies manage this vast amount of social media data to enhance their customer

relationship management [41]. Companies employ advanced technologies to manage and extract meaningful information from the extensive data generated through various types of social media in different formats [40]. Therefore, social media can be considered an essential strategic resource for generating data for market analysis and crowdsourcing innovative ideas [40, 42].

2.3. Resource Base Theory

RBT suggests that organizational resources are a significant factor at the organizational level that influences the dynamic capabilities of enterprises. Resource-rich organizations are more capable of planning, executing, and sustaining strategic change compared to average firms [28]. The acquisition of shared resources by enterprises contributes to value co-creation and, in turn, affects their dynamic capabilities [43]. Besides resource acquisition, resource integration is crucial, as many effective resources are not readily available; however, their utilization, combination, and innovation are essential [19]. Previous studies have demonstrated that embedding social media impacts the acquisition of corporate resources, such as social media usage patterns and information usage patterns, which have a significantly positive effect on entrepreneurs' bridging social capital and combined social capital [11]. However, there is limited academic research on the relationship between social media embedding and enterprise resource integration, as well as a lack of research on the impact of the above two factors on the adaptability of small and micro start-ups. Therefore, the relationship and action path between social media embedding, resource integration and enterprise adaptability in the context of social media cannot be effectively revealed.

2.4. Vocational Ability Development Theory

VADT focuses on the process of cultivating and enhancing abilities. It involves organizations or individuals improving their knowledge systems, professional skills, and attitudes through systematic training to match their abilities with the required positions. Currently, much of the research on ability development revolves around vocational abilities. Entrepreneurship represents a new form of employment, and entrepreneurial ability is a higher level and a deepened vocational ability. Therefore, the study of entrepreneurial ability can draw upon relevant theories of vocational ability development [44].

Research in vocational development has expanded to address both personal career flexibility and structured professional advancement [45]. Current scholarship in this field emphasizes the connection between adaptable work competencies and long-term career sustainability, acknowledging that professional paths have become increasingly unpredictable in today's workplace environment. The field examines vocational development through multiple lenses, considering personal elements such as skill acquisition and individual adaptability, alongside contextual factors including workplace environments and technological changes [46]. This theoretical approach sheds light on the processes by which professionals acquire and sustain workplace competencies while navigating shifting career paths, highlighting the importance of ongoing professional development and adaptability.

Currently, constructivist theory is widely adopted in the field of vocational ability development. It posits that knowledge is not passively accumulated but rather the result of active organization by individuals. According to this theory, individual cognition is an adaptive process that enables individuals to navigate specific environments better. A significant portion of this knowledge stems from interactions influenced by social, cultural, and linguistic factors [47]. In some colleges and universities, entrepreneurship education is based on the constructivist approach. For instance, teachers impart applicable knowledge of entrepreneurship, invite entrepreneurship experts to provide guidance, and offer an entrepreneurship practice platform, all of which better nurture students' innovation and entrepreneurial qualities [48]. In the field of agriculture, farmers continuously enhance their professional abilities and achieve sustainable development through action learning in entrepreneurial practices. By utilizing the Internet to establish a blended training system, farmers can access practical and high-quality education resources, sustainable support services, and a communication ecosystem [23].

2.5. Social Media Embedding

Social media, an internet-based platform for content production and exchange among users, presents opportunities and challenges in today's lives [37]. Embeddedness theory elucidates the intricate relationship between organizational, economic behavior, and social systems [29]. In the internet era, scholars employ internet embedding to examine the relationship between human behavior and the internet [49]. The impact of social media on entrepreneurial activities is profound. Drawing from resource theory, scholars have discovered that controlling an organization's information technology resources can enhance its performance [28]. Social media serves not only as a medium for entrepreneurial learning and self-employment but also as a tool for entrepreneurial marketing and a source of entrepreneurial opportunities. Additionally, social media facilitates entrepreneurial networks and the entrepreneurial ecosystem [50]. The use of social media facilitates the integration of internal and external resources, particularly in managing external relationship management, responding to the market, developing new products/services, and advancing technology [51].

The Internet functions as both a content platform and a network platform; thus, internet embedding comprises two dimensions: network community embedding [52] and media embedding [39]. Social media, being the most prevalent tool on the internet, represents a typical form of internet embedding. Social media embedding pertains to the extent to which people utilize social media for work and personal life, reflecting the interdependent relationship between individuals and social media [53]. Similar to Internet embedding, social media embedding can also be categorized into two dimensions. Online community embedding refers to the breadth and intimacy of various social relationship networks formed by entrepreneurs on the Internet using social media platforms, such as Facebook and short video platforms. For example, some women in Africa have expanded their social circles through social media, developed personal care and beauty products from home, and thrived as women entrepreneurs [54]. Web media embedding refers to the frequency and extent to which entrepreneurs utilize the web media functions of social media, including searching and browsing for information, creating and sharing content, and engaging in social interactions through features such as voice and video [55]. It has been observed that women entrepreneurs in Setiu Wetland employ Facebook social media as an e-commerce and online platform to market local products to a wider customer base [56].

3. Hypothesis Development

3.1. Social Media Embedding and Adaptability of MSEs

The impact of social media on MSEs has consistently garnered the attention of scholars. Enhancements in social media platforms and their utilization have expanded the reach of MSEs to reach large audiences and brought about changes in the day-to-day operations of start-ups [57]. Empirical research demonstrates that the strategic utilization of social media can harness innovation, foster customer relationships, and enhance a firm's entrepreneurial orientation, as it provides valuable insights for identifying opportunities for innovation. Furthermore, leveraging social media enables entrepreneurs to become more entrepreneurial, adapt to dynamic environments, and create enhanced business value [58]. Companies utilize social media for community-based customer relationship management and entrepreneurial activities, and the technical environment of social media affects its management effectiveness. Simultaneously, the use of social media enhances a company’s entrepreneurial spirit [59]. The "crowd-creation" ecosystem fostered by social media promotes a focus on benefits, interactive feedback, and dynamic learning, thereby enhancing the dynamic adaptability of entrepreneurial enterprises [60]. Entrepreneurs obtain information through social media, drive related transactions, and enhance the income and operational efficiency of their entrepreneurial enterprises. The media-based information and network interaction facilitated by social media contribute to more personalized and real-time enterprise services. Social media serves as a channel with the potential to transmit information that helps mitigate uncertainty and enhance perceived distinctions for start-ups [61]. Social media has provided enterprises with an effective means to access external resources and knowledge, thereby fostering innovation. Enterprises utilize social media for cross-border integration, allowing resource sharing, complementing each other's strengths, and enhancing their capabilities [62]. With its substantial user base, social media has become an efficient marketing platform through which products can gain visibility [18]. Additionally, social media facilitates knowledge innovation, enhancing coordination, integration, reconstruction, and transformation abilities, thereby impacting the dynamic ability of enterprises [63]. Integrating the above literature, this paper puts forward the following hypotheses:

H1: Network community embedding has a positive impact on the adaptability of small and micro start-ups.

H2: Network media embedding has a positive impact on the adaptability of small and micro start-ups.

3.2. Social Media Embedding and Resource Integration

Information technology plays a crucial role in driving productivity and enables the strategic utilization of resources. The use of information technology enables customer and competitor analysis, as well as the integration and application of market information into business strategies, allowing for market-driven capabilities to handle external pressures [18] effectively. Furthermore, users of information technology can enhance company business processes by reallocating resources, upgrading product designs, reconfiguring systems, and advancing product capabilities, thereby improving technical capabilities [64]. The literature supports the impact of social media embedding on enterprise resource integration. Social media holds significant implications for the fundraising success or failure of start-ups. Devoting effort to utilizing online social media and consciously harnessing their potential contributes to the financial success of start-ups [65].

Brahma & Dutta [18] discovered that internet embeddedness enhances communication among entrepreneurial teams, broadens their network of relationships, and fosters entrepreneurial learning, enabling them to access entrepreneurial resources in external social networks and effectively use such resources. Within the social media environment, embedding online communities not only helps start-ups acquire potential resources and opportunities for enterprise innovation and growth but also facilitates their cross-industry and cross-network integration, thereby significantly enhancing resource allocation efficiency [62]. As a widely used media tool, social media enables start-up companies to engage in extensive marketing activities, convey business management concepts and product information, and establish

a foundation for network relationships and corporate reputation, thereby facilitating resource acquisition and integration. Simultaneously, entrepreneurial enterprises leverage social media to swiftly and timely acquire various information from customers and networks, integrate resources, and drive product and service innovation [66, 67]. Hence, the following assumptions can be derived:

H3: Network community embedding has a positive impact on the resource integration of MSEs.

H4: Network media embedding has a positive impact on the resource integration of MSEs.

3.3. Resource Integration and Adaptability of MSEs

According to RBT, an organization's diverse resources directly influence its business activities. In a dynamic market environment, to maintain a sustainable competitive advantage, an enterprise must continuously acquire, integrate, and develop resources [68-70]. Individuals with specific resources are better equipped to identify opportunities and establish companies based on unique resources, resulting in heterogeneous outputs that surpass the market and initiate entrepreneurial activities, eventually growing into entrepreneurs [71]. Brush et al. [72] summarized the primary challenges entrepreneurial enterprises face in resource allocation as resource concentration, attraction, integration, and transformation. Thus, resource integration is critical in constructing an entrepreneurial enterprise resource base [73]. Scholarly research has demonstrated that resource integration is closely linked to the development of enterprise dynamic adaptability [63]. In the face of a rapidly changing environment, enhancing dynamic capabilities becomes a crucial concern for start-up business operations. Firms can enhance their adaptability by acquiring strategic supplements or forming key resource alliances [74]. As the external environment changes and the internal organization evolves, enterprises must continually acquire external resources, allocate internal resources, and integrate them to establish adaptability based on shifting external conditions [26].

This ability enables continuous adjustments to the internal management mechanism, enhances the enterprise's dynamic capabilities, and fosters its growth and development [75]. Enterprises not only integrate external market resources, supply chain resources, social resources and financial resources but also integrate internal material resources, capital resources, human resources, and information resources to enhance their dynamic capabilities [19]. When embarking on business ventures on social media platforms, various factors, including resources, strategies, products, and infrastructure, all impact entrepreneurial behavior. However, the resource factor holds the greatest importance, aligning with the RBT [76]. In the social media environment, the integration of internal and external resources within enterprises, based on social networks, is strengthened, enabling entrepreneurial enterprises to transcend organizational boundaries, engage in collaborative innovation, enhance their dynamic capabilities, gain sustainable competitive advantages, and better adapt to a dynamic environment [19]. Based on the above analysis, this paper proposes the following research hypothesis:

H5: The integration of corporate resources in the context of social media has a positive impact on the adaptability of MSEs.

3.4. The Mediating Role of Resource Integration

In the social media environment, start-ups can leverage media tools and online social networks to integrate resources and build innovative business models. The customer value proposition drives the new business model, offering sticky value-added services that are managed through big data to create enterprise value. This enables enterprises to better adapt to the market needs and changes, leading to improved growth and development [77]. The use of social media continuously updates entrepreneurial enterprises' cognition, expands network boundaries, integrates various relationships and resources, and enhances the core dynamic capabilities of the enterprises. Enterprises can dynamically integrate their ecosystems more efficiently based on perceived competition patterns and changes in customer needs, establishing a new resource capability system and delivering a unique service experience to customers, thereby achieving sustainable success in service innovation in a turbulent environment [63]. Social media, as an internet-based application tool, aligns with the characteristics of openness and cooperation in the sharing economy and business operations under the new normal of the internet. Enterprises can utilize Internet platforms to identify optimal partners, establish long-term strategic cooperative relationships, and efficiently integrate internal and external resources [78]. In the Internet context, companies leveraging social media to enhance customer engagement and drive innovation represent an effective integration of customer resources, fostering the organization's expansion and generation of productive ideas. Therefore, leveraging social media to embrace uncertainty can be used in multiple ways to promote an enterprise's agility, diversity, and adaptability in a changing, virtual, and fast-moving environment [79]. The comprehensive integration of social media resources provides entrepreneurs with opportunities for entrepreneurial growth, rapid learning, and content-based identity construction, facilitating the success of grassroots entrepreneurs in social media entrepreneurship [80]. Based on the above literature, the following hypothesis is put forward.

H6: Resource integration plays a mediating role between social media embedding and the adaptability of MSEs.

The research model of this paper is shown in Figure 1:

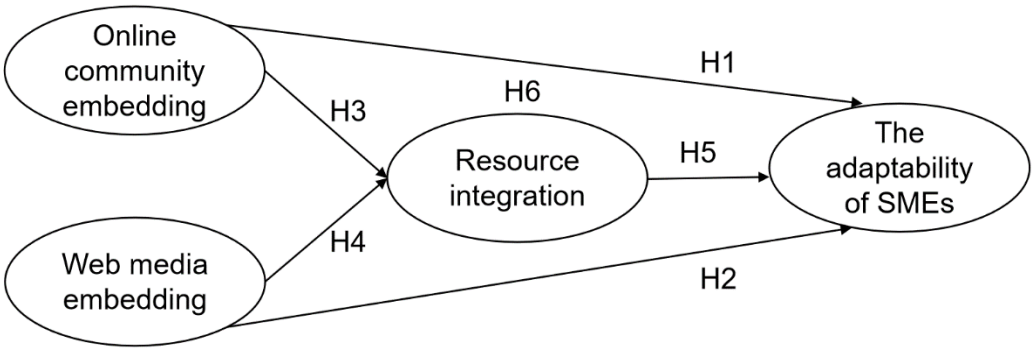

Figure 1. Research Model

4. Methodology

4.1. Questionnaire Design

This study collects data through a questionnaire survey. The scales of online community embedding and web media embedding were adopted from Zhang et al. (2017) [81]. Resource integration was measured using the scale developed by Ge & Dong [75].

The measurement framework, presented in Table 1, comprises five central constructs and their corresponding indicators. Internal consistency tests revealed strong reliability across all measures, with Cronbach's alpha values ranging from 0.839 to 0.919, exceeding the 0.7 threshold. Three indicators (NI1-NI3) measure online community embedding, showing the highest reliability ($\alpha = 0.919$) and reflecting social media relationship patterns. Web media embedding indicators (MI1-MI3) yielded a reliability of 0.881, measuring how organizations use social media for information sharing. Resource integration emerges as a higher-order construct, combining both acquisition and utilization aspects through six indicators (RA1-RA3 and RU1-RU3), with a reliability of 0.847. Enterprise adaptability measurement utilizes four indicators (CA1-CA4), achieving a reliability of 0.839, and assesses an organization's responses to market changes. Each measurement item was developed to capture specific aspects of its respective construct while maintaining clear boundaries between concepts, supporting the overall validity of the measurement approach.

Table 1. Variables and measurement indicators

Variables	Indicators		Measurement items	Cronbach's α
Online community embedding	NI1		I keep in close contact with my friends on social media networks.	0.919
	NI2		I have a lot of friends on social media that I can connect with.	
	NI3		I can obtain a lot of varied information from my social media friends.	
Web media embedding	MI1		I use social media a lot to post and obtain information.	0.881
	MI2		I used social media very early to post and obtain information.	
	MI3		My entrepreneurial activities are inseparable from the release and acquisition of information on social media.	
Resource integration	Resource acquisition	RA1	We obtain explicit resources (funds, material resources, etc.) for business operations from social media.	0.847
		RA2	We obtain hidden resources such as technology, management experience, reputation, etc., from social media.	
		RA3	The business management resources obtained from social media are very valuable.	
	Resource utilization	RU1	We efficiently synthesize resources obtained from social media.	
		RU2	We continuously utilize resources on social media.	
		RU3	Sources drawn from social media are fully integrated into enterprise products and service innovation.	
Enterprise adaptability		CA1	We are able to deal with threats from markets, financial institutions, governments, and industry associations in a timely manner.	0.839
		CA2	We are able to deal with sudden obstacles in a highly competitive environment.	
		CA3	We can quickly adapt to sudden changes in industrial policy, industrial structure adjustment, etc.	
		CA4	We are able to succeed in a fiercely hyper-competitive environment.	

4.2. Data Collection

Small and micro agriculture-related enterprises are the primary entrepreneurial entities under China's current rural revitalization strategy. The number of such enterprises has been increasing over the past two years. According to data from the 48th "Statistical Report on the Development of China's Internet", social media has gained widespread usage in the operations of agriculture-related enterprises, emerging as the most popular new agricultural tool. In this study, we selected these enterprises as the research objects to investigate the current utilization of social media and the adaptive development of small and micro enterprises in China.

This research employed a survey research methodology, and a total of 430 questionnaires were distributed to entrepreneurs of small and micro agriculture-related enterprises who participated in training at Fujian Agricultural Vocational and Technical College, utilizing a convenience sampling technique. After excluding the unqualified responses, 327 valid responses were obtained, resulting in a valid response rate of 76.05%. The sample consisted of 185 males, accounting for 56.58%, and 142 females, accounting for 43.42%. In terms of age, 176 respondents fell within the 31 -40 age range, representing 53.82%. Regarding education level, the majority of agricultural entrepreneurs possessed a high school (or technical secondary school) education, with 172 individuals accounting for 52.60%, while 108 farmers had a junior high school education, ranking second at 33.03%. In the field of entrepreneurship, there were 210, 25, 66, and 26 farmers engaged in large-scale farming, agricultural product processing, agricultural product sales, and agricultural tourism services, respectively. The research methodology flowchart of this study is indicated in Figure 2.

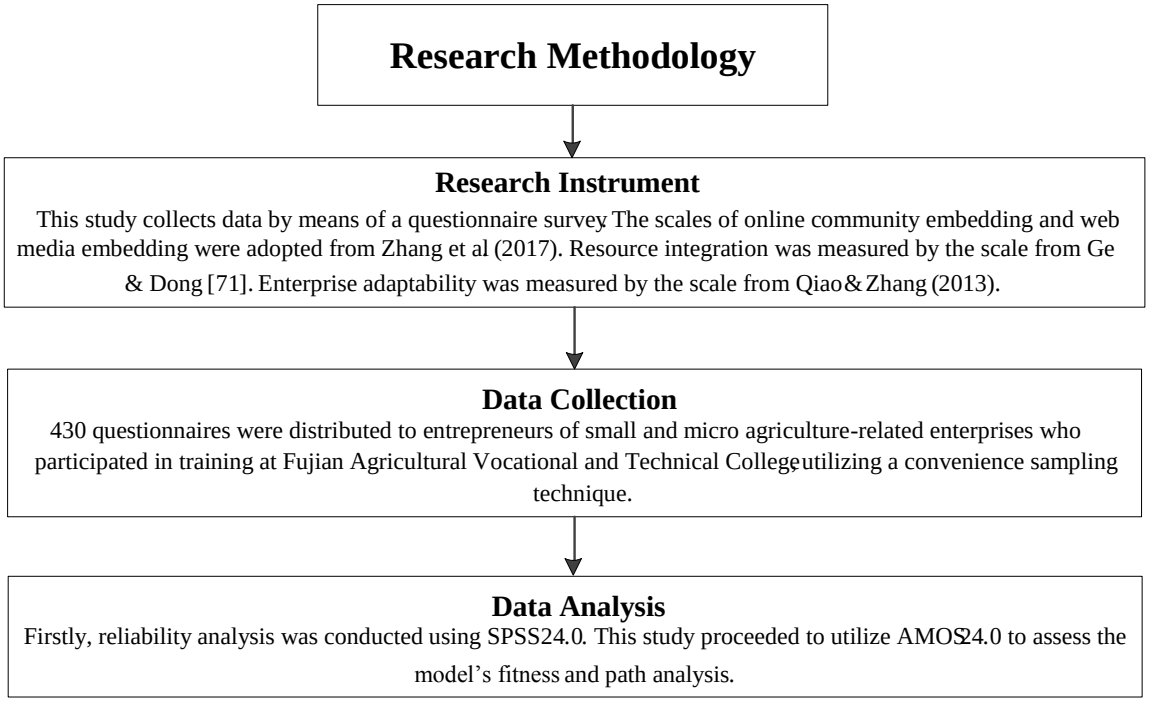

Figure 2. Research Methodology Flowchart

5. Analysis and Results

5.1. Reliability and Validity Tests

This study assessed the reliability and validity of the questionnaire's scales. Firstly, reliability analysis was conducted using SPSS 24.0. It was observed that the Cronbach's α values for the four variables—online community embedding, web media embedding, resource integration, and enterprise adaptability—were 0.919, 0.881, 0.847, and 0.839, respectively. These values exceeded the threshold of 0.7, indicating that the questionnaire scales exhibited desirable reliability. Table 1 presents these findings.

Subsequently, a confirmatory factor analysis was performed on the variables using AMOS 24.0. The results are displayed in Table 2. The average variance extraction (AVE) values for the research variables, namely online community embedding, web media embedding, and corporate adaptability, were 0.800, 0.714, and 0.570, respectively. These values all surpassed the recommended threshold of 0.5 standards proposed by scholars [82], indicating good convergent validity for each variable. Additionally, the AVE value for the resource integration variable was 0.490, which was also deemed acceptable.

Finally, the discriminant validity of the research variables was examined by comparing the square root values of the AVE for each variable with the Pearson correlation coefficient between the variables. As illustrated in Table 2, the square

root values of the AVE for each variable were 0.894, 0.845, 0.700, and 0.755, respectively. The Pearson correlation coefficients between the variables ranged from 0.501 to 0.746. Notably, the correlation coefficients between variables were all smaller than the square root value of the corresponding AVE on the diagonal, aligning with the recommendations of scholars [82]. Hence, the research variables demonstrated satisfactory discriminant validity, allowing for further analysis.

Table 2. Discriminant validity of variables

	AVE	Online Community Embedding	Web media embedding	Resource integration	Enterprise adaptability
Online community embedding	0.800	**0.894**			
Web media embedding	0.714	0.725	**0.845**		
Resource integration	0.490	0.501	0.586	**0.700**	
Enterprise adaptability	0.570	0.708	0.746	0.627	**0.755**

Note: The items in the boldface diagonal represent the square roots of the AVE; off-diagonal elements are the correlation estimates. AVE refers to the average variance extracted.

5.2. Structural Model Testing

This study proceeded to utilize AMOS 24.0 to assess the model's fitness. The findings are presented in Table 3. The $\chi 2/DF$ value is 2.643, which falls below the acceptable range of 3. Moreover, the CFI, GFI, TLI, RFI, NFI, and IFI values all exceed 0.9. Additionally, the RMSEA value is 0.071, which is lower than the recommended threshold of 0.08. All of the fit indices are within the acceptable range, suggesting that the model in this study exhibits a good fit and can be further tested.

Table 3. Model fit

Fitting index	χ^2/DF	TLI	CFI	GFI	RFI	NFI	IFI	RMSEA
Allowable range	$1<\chi^2/DF<3$	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	<0.08
Study model fit	2.643	0.939	0.950	0.906	0.905	0.922	0.950	0.071

The path relationship between the variables in the research model was examined using AMOS 24.0, and the results of the path coefficients are presented in Table 4 and Figure 3. Online community embedding ($\beta = 0.239$, $p < 0.001$) and online media embedding ($\beta = 0.295$, $p < 0.001$) significantly and positively influence the adaptability of agricultural enterprises, supporting Hypotheses 1 and 2. This outcome suggests that community activities and media initiatives undertaken by agriculture-related entrepreneurs through social media directly promote the adaptability of entrepreneurial enterprises.

However, the path analysis between online community embedding ($\beta = 0.099$, $p = 0.055$, n.s.) and resource integration did not yield significant results, indicating that the community activities of agricultural entrepreneurs on social media do not have a significant positive impact on resource integration. Therefore, H3 is not supported. Cultural dynamics within rural China may explain the modest connection between online community embedding and resource integration. Traditional guanxi networks and kinship ties create institutional patterns that potentially restrict the exploitation of online community resources by MSEs. Rural enterprises' tendency to maintain established offline connections over digital network expansion may limit their resource diversity. The cultural emphasis on familiar, trust-centered relationships may inhibit meaningful engagement with broader online communities, thereby diminishing the benefits of integrating resources through digital community participation.

Conversely, the path analysis between web media embedding ($\beta = 0.303$, $p < 0.001$) and resource integration yielded significant results, suggesting that the media activities of agricultural entrepreneurs on social media have a significant positive impact on resource integration, supporting H4. The role path between resource integration ($\beta = 0.313$, $p < 0.001$) and enterprise adaptability also passed the test. This implies that agricultural entrepreneurs' acquisition and utilization of resources in the context of social media can enhance the adaptability of enterprises in complex environments, demonstrating a significant positive effect and supporting H5.

Table 4. Path analysis results

Action path	Estimate	S.E.	C.R.	*p*	Hypothesis	Result
Online community embedding → Enterprise adaptability	0.239	0.054	4.469	***	H1	support
Web media embedding → Enterprise adaptability	0.295	0.062	4.752	***	H2	support
Online community embedding → resource integration	0.099	0.052	1.922	0.055	H3	Not support
Web media embedding → resource integration	0.303	0.058	5.187	***	H4	support
Resource integration → Enterprise adaptability	0.313	0.076	4.11	***	H5	support

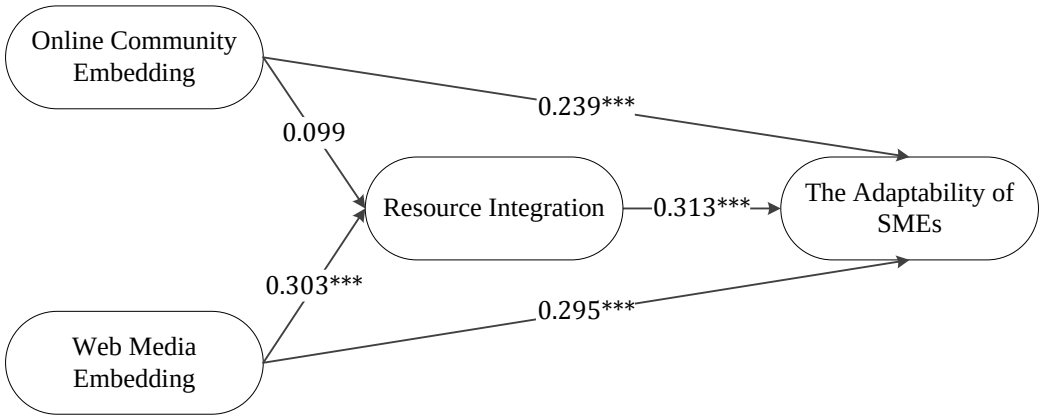

Figure 3. Empirical Results

To examine the mediation mechanism of social media embedding on the adaptability of entrepreneurial enterprises, this study employs the bootstrapping method with 5,000 repeated samples at a 95% confidence level using AMOS 24.0 software. As shown in Table 5, the mediating effect of resource integration has a point of 0.126, a Z value of 3.000, and a bias-corrected confidence interval of [0.055, 0.224]. The non-parametric percentile confidence interval is [0.049, 0.215], both of which exclude 0, indicating a significant level of mediating effect for resource integration. Therefore, H6 is supported.

The analysis of the mediation path, "web media embedding→resource integration→enterprise adaptability," reveals a point estimate of 0.095 and a Z value of 3.065. The bias-corrected confidence interval is [0.045, 0.169], and the non-parametric percentile confidence interval is [0.037, 0.159], neither of which contains 0. This indicates that the path "web media embedding→resource integration→enterprise adaptability" has reached a significant level, indicating a significant mediating role of resource integration between web media embedding and entrepreneurial enterprise adaptability.

On the other hand, the analysis of the mediation path "online community embedding→resource integration→enterprise adaptability" shows a point estimate of 0.031, and a Z value of 1.348, which is less than 1.96. The bias-corrected confidence interval is [-0.001, 0.092], and the non-parametric percentile confidence interval is [-0.003, 0.086], both of which include 0. This suggests that this indirect path does not reach a significant level, indicating no significant mediating role between online community embedding and firm entrepreneurial adaptability.

Table 5. Indirect effect analysis table of the mediation model

Effect	Point Estimate	Product of Coefficient		Bootstrap 5000 times 95% CI			
				Bias corrected		Percentile	
		SE	z-value	lower	Upper	lower	Upper
Mediating effect of resource integration	0.126	0.042	3.000	0.055	0.224	0.049	0.215
Web media embedding→ resource integration→ enterprise adaptability	0.095	0.031	3.065	0.044	0.169	0.037	0.159
Online community embedding→ resource integration→ enterprise adaptability	0.031	0.023	1.348	-0.001	0.092	-0.003	0.086
The total effect of online community embedding on enterprise adaptability	0.271	0.063	4.302	0.158	0.407	0.154	0.401
The total effect of web media embedding on enterprise adaptability	0.334	0.064	5.219	0.225	0.486	0.214	0.469

6. Discussion

6.1. Comparison of Results

As shown in Table 4, social media embedding has a significant and positive impact on the adaptability of MSEs. These findings can be compared to a previous study conducted by Eze et al. [83] in Nigerian SMEs. Eze et al. [83] conducted research on social media, focusing mainly on large corporations in the Western world and assuming that SMEs operate similarly to large corporations. However, they aimed to identify the significant factors in social media embedding specific to SMEs. The study focused on the antecedents that impact an SME's adaptability to social media, employing a qualitative approach and using interviews as its research instrument. They collected data from 20 samples selected from the directories of Nigeria. Eze et al. [83] enhanced the technology–organization–environment (TOE) framework model through their research, with a particular emphasis on communication and the identification of eleven significant attributes for successful social media adaptation in SMEs. Their study also highlighted the significant

association between TOE and social media adaptation in SMEs, offering valuable insights for enhancing SMEs' adaptability to social media embedding using an enhanced TOE model. Additionally, Eze et al.'s [83] framework can serve as a tool for evaluating barriers to SMEs' adaptability to social media.

The empirical results of the current study also demonstrate that social media embedding can significantly and positively promote the integration of resources among MSEs. These findings can be compared to an earlier study by Wu et al. [19] that examined the role of social media influencers using resource integration theory. According to their study, social media tools have significantly empowered influencers to influence the purchasing behavior of their followers. However, there is a research gap in understanding the influence of social media on influencers, specifically regarding the integration of customers' resources in social commerce. Wu et al. [19] conducted a qualitative study to explore the role of social media in the resource integration behavior of service innovation. The theoretical foundation of their study is based on service-dominant logic and the technology affordance theory, aiming to explain how social media influencers impact clients' resource integration.

In addition, the current study found a significant association between resource integration and MSE's adaptability. These results can be compared to a previous study conducted by Metaxiotis [84]. According to Metaxiotis's [84] study, SMEs must continuously innovate and adapt to the dynamic market structure by leveraging their intellectual capital through knowledge-based networks. The study focused on examining the integration of enterprise resource planning (ERP) and knowledge management (KM and its impact on SMEs' adaptability. Metaxiotis's [84] paper conducted a comprehensive literature review on ERP and KM adaptability in SMEs, and the research framework was developed based on this review, offering a viable solution for SME adaptability related to resource integration. The findings indicated that the proposed model is an adaptable solution for SMEs with traditional business structures, leveraging existing IT applications and building upon them. However, SMEs should ensure that their KM initiatives align with their organizational culture; otherwise, they should be prepared to modify them before applying the proposed model. Metaxiotis's (2009) [84] research framework provided valuable implications for SMEs' adaptation to resource integration and KM.

Table 5 also presents new findings, showing that social media embedding has a significantly positive influence on the adaptability of entrepreneurial enterprises through the mediating effect of resource integration. These results shed light on the complex mechanism through which social media embedding affects the adaptive capacity of MSEs. Specifically, resource integration plays a significant mediating role between network media embedding and MSEs' adaptability. These findings can be compared to an earlier study conducted by Chang [85]. Chang's [85] study also explored the mediating role of resource integration, focusing on the association between external factors (relationship learning) and internal factors (adaptability) in new product development (NPD). Chang's [85] research employed a quantitative approach, using a survey questionnaire as the research instrument. The study targeted 167 manufacturing industries in Taiwan for data collection. The questionnaire survey collected data from these Taiwanese manufacturing companies. Chang's [85] study highlighted the importance of both external and internal capabilities for firm investment. The Taiwanese industries were also categorized into high, medium, and low capability groups based on their capabilities. The findings revealed that high-capability firms exhibited a high level of resource integration, medium-capability firms demonstrated a moderate level of resource integration, and low-capability firms had a minimal level of resource integration.

6.2. Managerial Implications

The findings of this research have significant implications for the management of MSEs. The survival and growth of MSEs depend on their ability to adapt and effectively integrate resources dynamically. The widespread use of mobile internet and social media has empowered MSEs with information technology, enabling them to adapt more dynamically to environmental demands and enhance their overall development. The conclusions of this study have the following implications:

First, to achieve better development, MSEs, particularly those in rural and remote areas, should enhance their utilization of social media technology. By incorporating social media into their daily operations and development, MSEs can leverage the power of information technology and address the challenge of limited dynamic adaptability. Through social media's web capabilities, MSEs can disseminate information, creatively promote products or services, foster customer connections, enhance customer loyalty, and improve business performance. Simultaneously, by engaging with social networks, enterprises can access more valuable policy, market, and technical information, enabling them to update their management concepts, flexibly adjust their market competition strategies, mitigate risks, and ultimately achieve better survival and growth.

Second, MSEs should actively harness the dual effects of social media network embedding and media embedding. It is recommended that MSEs utilize social media to enhance their internal environment. By establishing an enterprise

operational and managerial community, MSEs can leverage online networks to expedite information flow, enhance information transparency, and improve internal management efficiency. Encouraging employees to contribute suggestions through social media can provide valuable insights for business operations. Furthermore, MSEs should leverage the bridging function of social media to cultivate external networks and engage with diverse communities. Social media can help MSEs establish new relationships, accumulate diverse social capital, and integrate more and better resources, thereby enhancing their capabilities and achieving sustainable development goals.

Third, managers and entrepreneurs operating MSEs should continuously enhance their operational literacy and proficiency in utilizing social media. Given the rapidly evolving nature of social media on the information technology platform, the emergence of innovative social media poses significant challenges for MSEs. Strengthening learning efforts and continuously improving media literacy and operational skills are crucial to effectively harnessing social media's network function and impact, ultimately serving the survival and development of entrepreneurial enterprises.

These findings provide essential guidance for policymakers developing support programs for MSE digital transformation. The demonstrated differences between online communities and web media embedding necessitate distinct support approaches. Training initiatives should first focus on web media embedding essentials, helping MSEs establish their digital presence and enhance their information-sharing capabilities. This foundation should then be complemented by advanced programs targeting online community embedding, with a specific focus on relationship cultivation and network expansion. This sequential development approach acknowledges the foundational nature of web media skills while recognizing that community embedding requires more sophisticated, sustained support. Additionally, policymakers should consider establishing mentorship structures where digitally successful MSEs share expertise in both embedding aspects with developing enterprises.

Finally, considering the positive impact of social media on enterprises' dynamic adaptability, the government should strengthen relevant policy support. This includes improving rural mobile information network infrastructure, reducing mobile phone network fees, and providing subsidies to farmers for the purchase of mobile phones. These proposed measures will further enhance mobile internet penetration rates in rural areas and promote the effective application of social media in rural entrepreneurship. Additional policy suggestions also involve enhancing the online media literacy of small and micro agricultural entrepreneurs. By offering diverse social media entrepreneurship training, entrepreneurs can enhance their social media management skills, enabling them to utilize social media more effectively for entrepreneurial purposes.

7. Conclusion

The study advances knowledge of social media embedding's influence on resource integration and adaptability within agricultural MSEs. Empirical evidence reveals the significance of social media embedding through its community and media dimensions as key drivers of adaptability. Resource integration emerges as an essential mediator, transforming social media engagement into gains in organizational adaptability. The research highlights the pronounced effect of web media embedding on resource integration compared to community embedding, indicating a structured digital platform's advantage over informal networks in resource acquisition processes.

From a theoretical standpoint, this research advances resource-based theory by demonstrating how digital transformation, particularly through social media embedding, enhances the adaptive capabilities of MSEs. The findings have significant practical implications for MSE managers and policymakers, emphasizing the strategic use of social media in fostering organizational resilience. Managers should prioritize developing comprehensive social media strategies that effectively combine community engagement and formal web media presence, while strengthening their ability to integrate resources. Future research opportunities include examining these relationships across different industries and investigating how organizational characteristics moderate the effectiveness of social media embedding. Longitudinal investigations could reveal how these relationships evolve as digital technologies advance. Although focused on agricultural MSEs, this framework provides a foundation for understanding digital transformation across various organizational contexts, advancing both theoretical knowledge and practical applications in organizational adaptation and digital strategy.

7.1. Limitations and Future Research

This paper offers theoretical and empirical evidence supporting the utilization of social media by MSEs. Currently, the market environment is replete with opportunities and challenges, and while most MSEs' dynamics still face limitations, the adoption of social media presents an innovative technological approach to entrepreneurship for small and micro businesses. This has inspiring implications for the sustainable development and digital transformation of small and micro agricultural enterprises.

The cross-sectional nature of this research presents a methodological constraint, as it examines social media embedding and MSE adaptability at one specific time point. This approach limits understanding of the evolutionary

aspects of social media practices and their ongoing organizational impact. Longitudinal studies would enhance our understanding of the development of embedding patterns over time, particularly during enterprise maturation and technological advancement. Extended temporal analysis can identify key adoption milestones, assess the effectiveness of resource integration across different stages, and examine variations in the embedding-adaptability relationship during technological and organizational development phases.

This study was conducted in China, which is deemed an emerging economy. To gather additional insights, future studies can target developed economies. Furthermore, a comparative analysis between the emerging and developing economies can also be conducted to acquire further insights.

Although SEM analysis revealed direct relationships and the mediating role of resource integration, the study's scope leaves certain boundary conditions and alternative mediating paths unexplored in the connection between social media and adaptability. The relationship may be influenced by internal and external factors, such as their sense of innovation mindset and entrepreneurial models. Investigating these issues would involve a deeper exploration of the influencing factors in the digital transformation of MSEs, providing more comprehensive guidance for entrepreneurial practices. Future investigations could expand this framework by examining how digital literacy and entrepreneurial orientation moderate these relationships through multi-group analyses or SEM interaction terms, thereby revealing the influence of organizational characteristics on social media embedding outcomes.

Additionally, knowledge management is considered to have a significant impact on technology, marketing, organization, and human resource management for start-ups [86]. Future research could further examine the relationship between social media usage and knowledge management in small and micro enterprises by exploring additional mediating mechanisms. Through innovation capability and knowledge management, it could uncover various routes linking social media embedding to MSE adaptability. Such theoretical expansion would deepen our understanding of these relationships while revealing how organizations can optimize the benefits of their social media integration.

Detailed case analyses of successful agricultural MSEs in China would strengthen the practical relevance of these findings. Examining specific implementation strategies of leading enterprises would provide tangible insights into effective social media embedding practices and operational challenges. Such empirical examples would demonstrate navigation methods within China's digital landscape, particularly in terms of the balance between community engagement and media presence. These sector-specific illustrations would offer practical implementation models for agricultural enterprises, bridging theoretical concepts with operational strategies in the context of China's digital agricultural transformation.

8. Declarations

8.1. Author Contributions

Conceptualization, G.X. and X.S.; methodology, G.X., X.S., and Z.L.; validation, Z.L. and J.W.; formal analysis, G.X.; investigation, G.X.; writing—original draft preparation, G.X., X.S., Z.L., and J.W.; writing—review and editing, G.X., X.S., Z.L., and J.W.; visualization, Z.L. and J.W.; supervision, X.S.; funding acquisition, G.X. and X.S. All authors have read and agreed to the published version of the manuscript.

8.2. Data Availability Statement

The data presented in this study are available in the article.

8.3. Funding

This research was funded by Natural Science Foundation Project of Fujian Science and Technology Department (Grant Number: 2021J011247) and Fujian Business College Digital Smart Retail Management Scientific Research Innovation Team Support Plan (Grant Number: CXTD202303).

8.4. Institutional Review Board Statement

Not applicable.

8.5. Informed Consent Statement

Not applicable.

8.6. Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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