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A Development Model of the Impact of Social Media on the Emerging Era of Interactive Learning in Sichuan Province, China

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Abstract

This study explores the determinants of teachers' work performance using social media, drawing on media synchronicity theory (MST), social capital theory (SCT), and integrated marketing communications (IMC) Theory. A comprehensive survey was administered to 622 faculty members across ten prominent universities in Sichuan Province, China, using a 7-point Likert scale for response measurement. Data were collected via structured questionnaires and analyzed using structural equation modeling (SEM). The findings indicate that online communication, information transfer, resource exchange, and social capital positively influence work performance, with social capital and technology stress serving significant mediating roles. This study contributes to the literature by elucidating complex determinants of work performance in the context of higher education and underscores the direct effects of digital communication and resource sharing, as well as the critical mediating roles of social capital and technology stress. However, this study is limited by its focus on a single region and reliance on self-reported data. Future research should include a more diverse sample and incorporate qualitative methods to more deeply understand educators' subjective experiences with social media in educational settings.

Keywords: *Social Media in Education, Work Performance, Social Capital Theory, Media Synchronicity Theory, Teaching Performance, Structural Equation Model (SEM).*

INTRODUCTION

In recent decades, the extensive adoption of social media platforms has significantly reshaped the global landscape, evolving from mere tools for communication to sophisticated networks utilized for diverse purposes such as business networking and social activism. This transformation has profoundly impacted the educational sector, a domain inherently sensitive to societal and technological changes (Ajibade et al., 2022). Traditionally reliant on established pedagogical methods, educators are now increasingly utilizing these digital platforms to expand the scope of their teaching practices, enhancing resource sharing and fostering international collaborations. Despite the apparent benefits, this evolution necessitates a critical examination of how educators' engagement with social media influences their primary responsibilities.

The surge in social media utilization in China is emblematic of this global transformation, where a marked increase in internet users has established the nation as a significant force in the digital domain (Chen et al., 2021). Within the educational framework, the deployment of digital tools is designed to enhance student engagement and improve learning outcomes. Social media's role in education surpasses basic communication; it creates a dynamic learning environment that supports collaborative learning, facilitates immediate feedback, and provides access to a vast spectrum of instructional resources (Beason-Abmayr et al., 2021). These platforms enable real-time interactions that extend beyond conventional educational boundaries, fostering a more inclusive and engaging learning experience. Furthermore, the integration of diverse multimedia elements into pedagogical resources accommodates various learning styles and boosts the retention of information. Additionally, social media contributes significantly to professional development, offering educators expansive resources and opportunities for networking (Carlucci et al., 2019).

However, the integration of these digital tools into educational strategies presents several challenges, including digital distractions, the quality of the information shared, and the management of boundaries in online student-

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teacher interactions (Kostko, 2019). Addressing these issues necessitates that educators not only develop technological skills but also build a robust foundation in digital literacy and adhere to ethical practices online. In Sichuan Province, China, this scenario is further complicated by economic disparities relative to Eastern China, which lead to varied social media adoption rates and differing impacts within educational institutions.

The academic exploration of faculty performance has predominantly concentrated on traditional pedagogical strategies and performance enhancement techniques, yet it has not fully explored the intersection of these methods with modern digital tools like social media (AlAwadhi & Dashti, 2021). While foundational theories such as motivation, developmental, and planned behavior theories have been instrumental in understanding educational dynamics, the application of Media Synchronicity Theory (MST) in the digital interactions of educators and students in higher education reveals significant gaps, particularly in its direct influence on teacher performance (Axelsson et al., 2021; Badshah et al., 2021). Similarly, while social capital theory has been effective in corporate settings, its implications for pedagogical behavior and teacher development remain underexplored, suggesting a need for a synthesized approach that integrates MST and social capital theory to assess the impact of social media on educational performance (Engelbrecht et al., 2023; Ignacimuthu & Vijayakumar, 2022; Kuipers et al., 2022). Moreover, research on social media within the specific context of Sichuan's higher education is scant, with significant gaps in understanding the geographical, cultural, and economic impacts on social media's educational influence, the effects of educators' personal social media use on their teaching methods, the implementation of digital policies, and the broader socio-economic influences on education.

Addressing the identified gaps is pivotal for developing strategies that leverage social media to enhance educational outcomes and mitigate potential challenges. This study employs a quantitative methodology with multiple objectives, primarily aimed at identifying the factors that influence the impact of social media on the teaching performance of higher education faculty. It also seeks to ascertain the mediating roles of social capital and technological pressures in predicting teaching efficacy. Furthermore, the study intends to construct a model illustrating how social media utilization can be optimized to augment faculty teaching performance. A quantitative analysis will examine how various demographic factors—such as gender, educational background, work experience, age, and workplace type—modulate responses to technology stress and social media engagement. Ultimately, this research will offer empirically grounded recommendations for stakeholders to enhance the effectiveness with which higher education faculty utilize social media to improve their teaching performance.

This study unfolds in a structured manner, beginning with an extensive literature review that establishes the theoretical framework, focusing on Media Synchronicity Theory, Social Capital Theory, and Integrated Marketing Communication. Following the literature review, the methodology section details a purely quantitative approach, emphasizing data collection and analysis strategies specific to this methodological paradigm. The results are presented in the fourth section, where quantitative data analysis and hypothesis testing are thoroughly conducted. The study concludes with a discussion and conclusion section, which synthesizes the findings, discusses their implications, identifies limitations, and suggests directions for future research. This organizational structure ensures a rigorous and focused exploration of the relationship between social media usage and educational outcomes in higher education, strictly through quantitative lenses.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Theoretical Approach

Media Synchronicity Theory (MST), posited by Dennis et al. (2008), delineates two fundamental communication processes essential for task completion: message dispersion and message convergence, which vary in necessity based on task demands. MST provides a framework for understanding media synchronicity competencies, refining communication processes, job responsibilities, and media competencies to enhance team effectiveness in using communication media. The theory identifies five strategies to foster shared understanding: action, triangulation, situationalization, reasoning, and acceptance. These strategies facilitate the dissemination and convergence of information, leading to a consensus among team members. Job duties are segmented into four phases—initialization, problem-solving, conflict management, and execution—that help teams navigate their responsibilities and achieve objectives (Triawang & Kurniawan, 2021). Media competencies

are crucial, affecting how information is dispersed and converged, with higher transmission rates favoring synchronicity. Rautela et al. (2022) further suggest that job performance improves as individuals enhance their capacity to utilize multiple media tools simultaneously.

Social capital theory, which has gained prominence since the 1970s, categorizes social capital into three interconnected levels: micro, meso, and macro. The micro level views social capital as an individual resource utilized to achieve personal goals through social relationships, while the meso level focuses on the network attributes that maximize resource access. The macro level emphasizes the influence of the social environment on resource accessibility, internal cooperation, and group efficiency. Additionally, social capital is divided into internal and external types: micro and meso levels are considered external, involving inter-organizational associations, whereas macro-level social capital is internal, deriving from interactions within a group. In educational settings, teachers' use of social media is posited to enhance internal social capital by fostering connections, standardization, trust, and cooperation among colleagues, thus improving resource acquisition, cooperative relationships, and ultimately teaching efficiency (Aguilar et al., 2021).

The integration of Integrated Marketing Communications theory into education, especially through teachers' use of social media, enhances teaching performance by fostering a cohesive communication strategy across various platforms. This approach emphasizes consistent educational messaging across digital channels, reinforcing the educational narrative and engaging students effectively. Additionally, the data-driven nature of IMC allows teachers to utilize social media analytics to tailor educational content to student preferences and learning needs, optimizing educational outcomes. Moreover, IMC's focus on resource exchange promotes collaborative and student-centered methodologies, enriching instructional materials and fostering a community among learners. This strategic application of online communication, information transfer, and resource exchange within the IMC framework underscores a significant adaptation to the digital landscape in education, showcasing how social media can revolutionize teaching effectiveness through consistent messaging, student engagement, and responsive strategies.

Hypothesis Development

In the digital age, online communication has transformed education by enabling immediate, flexible interactions that allow educators to tailor teaching to individual needs. Platforms offer multimedia resources that cater to diverse learning styles and promote collaboration, extending classroom boundaries and enhancing learning through community-building (Hoogerheide et al., 2019). However, challenges like maintaining engagement and navigating the digital divide necessitate strategic planning to integrate online tools effectively with traditional methods. Thus, this study posits the following hypothesis:

H1: Online Communication Has a Positive Effect on the Teaching Performance

Social capital, crucial in education, is fostered by online communication that transcends physical and temporal limits, enhancing collaborative learning and professional development through continuous interaction (Debets et al., 2020). Platforms facilitate relationship building, sharing resources, and inclusive discussions, thereby strengthening educational networks and community ties (Blegur et al., 2023; Chao et al., 2021)). However, the effectiveness of forming social capital is contingent on the quality and authenticity of these online interactions. Therefore, the following hypothesis is proposed:

H2: Online Communication Has a Positive Effect on the Social Capital

Technostress, the stress from using or adapting to new technologies, is increasingly relevant in education due to the reliance on digital platforms (Arthur et al., 2022). The work from Barbato et al. (2022) posits that heightened online communication through social media and digital tools can exacerbate technology stress among teachers. This stress arises from the need to manage continuous communication, a variety of digital tools, and the expectation of constant availability, potentially blurring work-life boundaries (Adams et al., 2022). Additionally, the challenge of mastering multiple platforms can overwhelm those with limited tech proficiency, heightening stress. However, factors like technology literacy and institutional support can mitigate this stress, indicating that the impact of online communication on technostress is not uniform across all educators.

Consequently, the following hypothesis is proposed:

H3: Online Communication Has a Positive Effect on The Technology Stress

In the educational sector, information transfer through social media and digital platforms transcends mere knowledge dissemination, playing a pivotal role in enhancing social capital within the academic community (Soesmanto et al., 2023). Social capital involves the networks, mutual support, shared values, and understanding among educational stakeholders. The hypothesis posits that effective information transfer via social media bolsters these relational networks, thereby enriching social capital. Social media facilitates community building and collective learning by allowing educators and students to share insights and resources. Additionally, it expands professional networks beyond immediate physical confines, connecting individuals with global peers and experts, thus broadening access to diverse perspectives (Santagata & Sandholtz, 2019). The participatory nature of these platforms fosters collaborative learning and problem-solving, enhancing knowledge exchange and reinforcing trust and reciprocity—core aspects of social capital. However, the depth and authenticity of these interactions are crucial; superficial connections may not significantly foster meaningful social capital. Accordingly, the following hypothesis is posited:

H4: Information Transfer Has a Positive Effect on The Social Capital

In the educational landscape, the transfer of information through social media and digital technologies plays a crucial role in effectively disseminating knowledge and updates. This process significantly enhances teaching performance by enabling teachers to swiftly distribute educational materials, fostering more dynamic and responsive teaching methods (Weber, 2019). Moreover, the availability of various media formats like videos, podcasts, and interactive modules allows for diverse and engaging content delivery, addressing different learning styles and potentially enhancing student engagement and comprehension. Additionally, access to a wide range of current resources ensures that curricula remain relevant and up-to-date, vital in the continuously evolving field of education (Soesmanto et al., 2023). However, the positive impact of this information transfer on teaching quality is contingent upon the quality of the content, effective integration into teaching practices, and the digital literacy of both teachers and students. Consequently, the study posits the following hypothesis:

H5: Information Transfer Has a Positive Effect on The Teaching Performance

The hypothesis posits that transferring information through social media and digital platforms may inadvertently heighten technostress among educators. Characterized by tension, anxiety, and frustration, technostress stems from adapting to new technologies (Olson & Jiang, 2021). Contributory factors include the constant need to stay updated and swiftly disseminate information, which may overwhelm educators, particularly in dynamic environments (Meissner, 2021). Additionally, the necessity for proficiency across multiple digital platforms and their rapid evolution can induce feelings of insecurity, exacerbating technostress (Mashhadlou & Izadpanah, 2021). The blurring of work and personal life boundaries due to digital connectivity further compounds this stress. However, the negative impacts can be mitigated through institutional support, professional development, and enhanced individual technological competence. Therefore, the following hypothesis is available:

H6: Information Transfer Has a Positive Effect on The Technology Stress

This hypothesis suggests that resource exchange via social media and digital platforms significantly bolsters social capital among educators and students, defined as the networks, relationships, and norms that enable collective action and resource sharing within a community. The exchange of lesson plans, educational tools, and research materials not only spreads knowledge but also fortifies professional and educational relationships, fostering community and collaboration—central to social capital. Additionally, such interactions promote trust and reciprocity, crucial for maintaining robust, supportive networks and enhancing a collective educational identity (De Paola et al., 2023). Digital platforms facilitate connections beyond geographical and institutional limits, introducing diverse perspectives and enriching the educational community (Bi, 2020). However, the real impact on social capital hinges on the quality and authenticity of these interactions, as superficial exchanges may not yield significant benefits. Consequently, this study formulates the following hypothesis:

H7: Resource Exchange Has a Positive Effect on The Social Capital

This hypothesis explores how exchanging resources like educational materials and tools through digital platforms might inadvertently increase technology-related stress, or technostress, among educators. Technostress arises from the complexities of managing multiple digital platforms, which can overwhelm those unfamiliar with new technologies, leading to stress from constant engagement and a sense of overload (dos Santos & Forneck, 2022). Additionally, the need to stay updated with rapidly evolving digital tools adds pressure and insecurity, complicating the integration into teaching processes. Digital connectivity also blurs personal and professional boundaries, potentially disrupting work-life balance. However, factors like institutional support and digital literacy can mitigate the impact of technostress related to resource exchange. Thus, the following hypothesis is proposed:

H8: Resource Exchange Has a Positive Effect on The Technology Stress

The hypothesis posits that resource exchange via digital platforms enhances teaching performance by improving educational delivery quality (Astuhuaman & Cristóbal, 2021). Teachers gain access to diverse educational materials, which enrich teaching and cater to varied learning styles, increasing student engagement (Olson & Jiang, 2021). Additionally, resource sharing fosters collaboration and professional network development, promoting a culture of continuous learning (Safaie, 2020). Global connectivity through digital platforms also introduces cross-cultural perspectives, further enhancing educational practices. However, the effectiveness of this exchange depends on the relevance and quality of the resources shared, requiring careful selection and evaluation. Therefore, the following hypothesis is formulated as:

H9: Resource Exchange Has a Positive Effect on The Teaching Performance

This hypothesis asserts that strong social capital within educational communities, characterized by robust networks and relationships, significantly boosts teacher performance. Social capital enhances teaching effectiveness by providing access to a broader array of resources, collaborative opportunities, and support, enriching educators' practices. It also fosters a sense of belonging and collective identity, which boosts motivation and professional satisfaction, consequently leading to more dedicated teaching (Santagata & Sandholtz, 2019). Additionally, the trust inherent in these networks promotes open communication and adaptive teaching strategies, essential for ongoing professional development (Quoc et al., 2021). However, the impact varies based on interaction quality and teachers' ability to leverage these networks. Consequently, the following hypothesis is proposed:

H10: Social Capital Has a Positive Effect on The Teaching Performance

This hypothesis explores the nuanced role of technology stress in education, proposing that a manageable level of stress, characterized as eustress, could enhance teaching performance. Initially perceived negatively, technology stress might actually motivate educators to develop new skills and adapt innovative methods, improving effectiveness through the use of interactive educational tools (Neyra et al., 2021). Overcoming such challenges can also foster resilience and a growth mindset among teachers, further contributing to their capabilities (Lopes & da Silva, 2023). However, it is crucial that this stress remains manageable to prevent burnout and ensure its positive impact. Thus, this study posits the following hypothesis:

H11: Technology Stress Has a Positive Effect on The Teaching Performance

This hypothesis posits that the enhancement of teaching performance through online communication is mediated by the development of social capital. Platforms like social media facilitate interaction among teachers, fostering networks, shared norms, and trust—collectively termed social capital—which in turn improves teaching effectiveness (Frisch & van Treeck, 2022). These robust networks provide access to diverse resources and enhance responsiveness to student needs, thereby improving teaching methods. The quality of these online interactions, along with participant digital literacy and existing social capital, influences the strength of this effect (Mickel, 2021). Thus, the following hypothesis is proposed:

H12: Social Capital Mediates the Relationship Between the Online Communication and the Teaching Performance

This hypothesis argues that the process of transferring information through digital platforms affects teaching performance, with social capital acting as a mediator. In educational settings, digital tools facilitate the sharing of content and insights, contributing to the development of relationships and networks, or social capital. This network enhances collaborative learning, resource sharing, and professional support, ultimately improving teaching effectiveness (Chen et al., 2019). Strong professional networks provide access to diverse resources and enable collective problem-solving. However, the impact of social capital depends on the quality of the exchanged information and the platforms used. Consequently, the hypothesis is framed as below:

H13: Social Capital Mediates the Relationship Between the Information Transfer and The Teaching Performance

This hypothesis suggests that resource exchange among educators and students through digital platforms affects teaching performance, mediated by the development of social capital. In educational contexts, sharing educational materials and methodologies via digital technologies not only facilitates direct resource transfer but also enhances social networks, relationships, and shared norms, which constitute social capital (Ensign et al., 2018). Such networks provide diverse pedagogical tools and foster a collaborative environment, enhancing teaching adaptability and methods (Du et al., 2023). The trust and mutual understanding developed through this exchange are crucial for effective communication and collective educational pursuits. However, the impact of social capital is contingent on the quality of resources, digital literacy, and the pre-existing social capital among participants. Thus, this study propose the following hypothesis:

H14: Social Capital Mediates the Relationship Between the Resource Exchange and The Teaching Performance

This hypothesis suggests that while online communication via digital platforms is integral to modern educational practices, the associated technology stress, or technostress, may mediate its impact on teaching performance. Technostress results from the overwhelming need to constantly engage with digital tools, anxiety over rapid technological changes, and frustration managing online interactions. Although online communication offers immediacy and flexibility, it can lead to stress from information overload and blurred work-life boundaries, potentially diminishing teaching effectiveness. However, the impact of technostress varies based on factors like digital literacy, institutional support, and the user-friendliness of platforms (Grein, 2018). Therefore, the following hypothesis is framed as:

H15: Technology Stress Mediates the Relationship Between the Online Communication and The Teaching Performance

This hypothesis posits that while the transfer of information via digital platforms is crucial in modern educational practices, the resulting technology stress could mediate its impact on teaching effectiveness (Gopalan, 2019). Technology stress includes the challenges educators face in managing continuous updates, a variety of digital resources, and adapting to new technologies. This stress may compromise an educator's ability to organize and present information, adapt to student needs, and maintain engagement (Khan & Ghosh, 2018). The influence of technology stress varies based on educators' digital proficiency, platform usability, and institutional support. Consequently, this study posits:

H16: Technology Stress Mediates the Relationship Between the Information Transfer and The Teaching Performance

This hypothesis suggests that while exchanging resources like educational materials through digital platforms is vital for modern education, the associated technology stress could mediate its effectiveness on teaching performance. Educators face technology stress from managing digital platforms, continuously updating resources, and integrating various digital tools into teaching (Hoogerheide et al., 2019). This stress may hinder their ability to effectively use digital resources, engage students, and adapt teaching strategies (Janssen et al., 2019). The impact of technology stress varies depending on the educator's digital literacy, the usability of digital

platforms, and institutional support (Iwaszkiewicz et al., 2008). Therefore, this study posits the following:

H17: Technology Stress Mediates the Relationship Between the Resource Exchange and The Teaching Performance

METHODOLOGY

Employing quantitative method, data were collected via a structured online questionnaire. 800 questionnaires were disseminated through faculty members at the 10 promising universities in Sichuan province, China, yielding 622 valid responses. The data analysis was supported by SPSS and AMOS software, utilizing descriptive statistics for an initial overview, Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) to explore and confirm the relationships between variables, and Structural Equation Modeling (SEM) to test the hypothesized model.

The study implements a series of systematically organized online questionnaires, each meticulously formulated to accurately assess essential variables utilizing a 7-point Likert scale:

Earlier research on social media use measured usage intensity and its impact on job performance, which proved inadequate for dynamic environments (Sun & Shang, 2014). Later, usage was categorized into task and relationship types, leading to a 13-question scale that evaluates different usage goals (Riemer et al., 2015). This scale delineates three dimensions of teacher social media use: Online Communication, Information Transfer, and Resource Exchange. Each dimension includes specific items to assess how social media supports educational communication, content sharing, and resource exchange, crucial for understanding the integration and impact of social media in educational settings.

Social capital in teacher social media use is analyzed through three dimensions—structural, relational, and cognitive—each capturing different facets of professional interactions and community within educational settings (Ghorbanzadeh et al., 2021). Structural capital focuses on the frequency, intensity, and emotional depth of teacher interactions, enhancing connectivity and intimacy. Relational capital emphasizes trust and openness, fostering transparent communication across classrooms. Cognitive capital includes shared values and norms, promoting a unified commitment to institutional goals. These dimensions are divided into categories such as social interactions, trust, and shared vision.

Technology stress, as described in studies by Ragu-Nathan et al. (2008), arises when the rapid evolution of digital environments, particularly social media, increases rather than decreases stress levels. This stress is characterized by three dimensions: technological overload, technological intrusion, and technological uncertainty. These dimensions encompass the stress of adapting to new applications and workflows, the encroachment of work into personal time, and the uncertainty associated with constant updates and changes to technology.

Teaching performance, a crucial aspect of job performance in educational settings, is increasingly assessed in relation to the integration of social media platforms, which are believed to enhance teaching effectiveness. A specific scale has been developed to measure the impact of platforms on various dimensions of teaching, including productivity, convenience, scope of activities, and innovation. This scale evaluates how these digital tools contribute to teaching efficiency, flexibility, enhanced engagement, and the implementation of innovative teaching methodologies, reflecting the dynamic intersection of social media and contemporary educational practices.

RESULTS

Descriptive Analysis

Table 1 presents essential demographic and usage data related to a study on the use of social media for improving teaching performance. The gender distribution of participants is nearly equal, with 48.7% male (303 respondents) and 51.3% female (319 respondents), indicating a balanced sample in terms of gender.

Regarding age, the participants are primarily between 25 and 50 years old, encompassing 33.0% in the 25-35

age bracket, 33.6% in the 35-50 age bracket, with those over 50 years old making up 29.1%, and a smaller percentage below 25 years at 4.3%. This suggests that the majority of participants are in the prime of their professional careers. Educationally, the sample is highly qualified, with 56.6% holding a PhD or higher and 37.6% with a master's degree, while only 5.8% have an undergraduate degree or lower. This highlights the high level of academic achievement among the participants.

Social media platforms utilized for learning about or studying the enhancement of teaching performance vary, with Zhihu being the most popular (15.6%), followed closely by QQ (14.5%), Weibo (14.1%), and Xiaohongshu (13.7%). Less used platforms include WeChat (11.9%) and Facebook (2.1%), indicating diverse preferences for different social media tools among educators. The length of social media usage in their teaching shows a balanced distribution across different durations, with 27.3% using it for more than 10 years, and similar proportions using it between 1 to 10 years.

Lastly, the participants represent a variety of educational institutions from Sichuan, such as Sichuan University and Southwest Jiaotong University, each contributing between 9.0% to 10.9% of the sample. This diversity in institutions suggests a broad geographic and educational context for the study.

Table 1 Essential Information

		Frequency	Percent
Gender	Male	303	48.7
	Female	319	51.3
Age	< 25	27	4.3
	25-35	205	33.0
	35-50	209	33.6
	> 50	181	29.1
Education Level	Undergraduate degree and below	36	5.8
	Master	234	37.6
	PhD and above	352	56.6
On which social media have you learned about or studied the contents of improving teaching performance	Wechat	74	11.9
	Shake	81	13.0
	Weibo	88	14.1
	QQ	90	14.5
	Shutterbug	78	12.5
	Xiaohongshu	85	13.7
	Zhihu	97	15.6
	Facebook	13	2.1
	Others	16	2.6
The number of years you have used social media in your teaching	1-3	143	23.0
	3-5	157	25.2
	5-10	152	24.4
	> 10	170	27.3
	Chengdu University	57	9.2
	Sichuan University	68	10.9

The school you came from	Chengdu Normal University	59	9.5
	Chengdu Tech	66	10.6
	Southwestern University of Finance and Economics	62	10.0
	Chengdu Medical College	63	10.1
	Sichuan Agricultural University	60	9.6
	Chengdu University of TCM	65	10.5
	Southwest Jiaotong University	66	10.6
	Chengdu Sport University	56	9.0

Reliability and Validity

Table 2 presents Cronbach's alpha coefficients for various study variables to assess the internal consistency of the items within each scale. The variables assessed include online communication, information transfer, resource exchange, social capital, technology stress, and work performance, each comprising different numbers of questions. Cronbach's alpha values range from 0.815 to 0.933, indicating a high level of reliability and suggesting that the items within each scale consistently measure the respective constructs.

Table 3 provides results from the Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity. A KMO value of 0.956 suggests that the sampling is adequate for factor analysis. Bartlett's Test results, with a chi-square value of 12,560.247 and a significance level of .000, indicate that the correlation matrix is not an identity matrix and is suitable for factor analysis, supporting the factorability of the data. These statistics collectively confirm the appropriateness of the dataset for conducting reliable and valid factor analysis, reinforcing the underlying constructs' credibility in the study.

Table 2. Reliability Statistics

Study variables	Number of questions	Cronbach's α
Online communication	4	0.815
Information transfer	4	0.841
Resource exchange	4	0.840
Social Capital	10	0.933
Technology Stress	10	0.927
Work performance	4	0.836

Table 3. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**.956**
Bartlett's Test of Sphericity	Approx. Chi-Square	12560.247
	df	630
	Sig.	.000

Confirmatory Factors Analysis

Table 4 details various fit indices used to evaluate the goodness of fit for a structural equation model. The indices reported include the Chi-Square to degrees of freedom ratio ($\chi 2/df$), Root Mean Square Error of Approximation (RMSEA), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Normed Fit Index (NFI), Tucker-Lewis Index (TLI), and Comparative Fit Index (CFI). Each of these indices is compared against commonly accepted reference standards for determining an adequate fit. The results indicate that all indices meet or exceed the recommended thresholds, with $\chi 2/df$ at 1.433, RMSEA at 0.026, GFI at 0.933, AGFI at 0.923, NFI at 0.935, TLI at 0.978, and CFI at 0.979. These values suggest that the model provides an excellent fit to the data, reflecting a well-specified model.

Table 4.1 Measure Model Fit Metrics

Fit index	χ2/df	RMSEA	GFI	AGFI	NFI	TLI	CFI
Reference standards	<3	<0.08	>0.9	>0.85	>0.9	>0.9	>0.9
Result	1.433	0.026	0.933	0.923	0.935	0.978	0.979

Table 5 presents the results for assessing the convergence validity of latent variables in a structural equation model. Convergence validity is verified by examining the factor loadings, Composite Reliability (CR), and Average Variance Extracted (AVE) for each latent variable and its corresponding observed indicators.

Each latent variable—Online Communication, Information Transfer, Resource Exchange, Social Capital, Technology Stress, and Work Performance—is associated with several observation indicators. The factor loadings for these indicators, which represent the degree to which each indicator correlates with its latent variable, generally exceed the acceptable threshold of 0.7, indicating strong relationships and suggesting that the indicators appropriately measure their respective constructs.

The Composite Reliability (CR) for each latent variable is above 0.8, exceeding the commonly recommended threshold of 0.7, which signifies that the latent variables exhibit high internal consistency. This high level of reliability indicates that the items grouped under each latent variable consistently represent the construct. Average Variance Extracted (AVE) values are all above 0.5, the minimum acceptable level, indicating that more than half of the variance observed in the indicators is accounted for by their latent variables. This supports the assertion that a significant proportion of the indicator variance is due to the hypothesized underlying factors.

Table 5. Convergence Validity

Latent variables	Observation indicators	Factor loading	CR	AVE
Online communication	OC1	0.683	0.817	0.528
	OC2	0.719		
	OC3	0.759		
	OC4	0.742		
Information transfer	IT1	0.758	0.842	0.571
	IT2	0.771		
	IT3	0.761		
	IT4	0.731		
Resource exchange	RE1	0.777	0.840	0.568
	RE2	0.749		
	RE3	0.722		
	RE4	0.764		
Social Capital	SC1	0.735	0.933	0.583
	SC2	0.756		
	SC3	0.791		
	SC4	0.771		
	SC5	0.763		
	SC6	0.759		
	SC7	0.790		
	SC8	0.770		
	SC9	0.739		
	SC10	0.758		
Technology Stress	TS1	0.733	0.927	0.559
	TS2	0.769		

	TS3	0.760		
	TS4	0.757		
	TS5	0.760		
	TS6	0.726		
	TS7	0.758		
	TS8	0.731		
	TS9	0.757		
	TS10	0.724		
Work performance	WP1	0.723	0.836	0.561
	WP2	0.726		
	WP3	0.781		
	WP4	0.764		

Table 6 assesses the discriminant validity of latent variables within a structural equation model. Discriminant validity evaluates whether concepts or measurements that are supposed to be unrelated are, in fact, distinct.

In this table, the diagonal entries represent the square roots of the Average Variance Extracted (AVE) for each latent variable, including Online Communication, Information Transfer, Resource Exchange, Social Capital, Technology Stress, and Work Performance. These diagonal values are compared against the off-diagonal elements, which display the correlations between pairs of latent variables. For discriminant validity to be established, the square root of the AVE for each latent variable (shown on the diagonal) should be greater than the correlations between the latent variable and any other latent variable (shown off-diagonal).

The AVE square root for Online Communication is 0.727, which is higher than its correlations with all other latent variables (ranging from 0.459 to 0.521). This pattern repeats across the table, where each diagonal entry is higher than its corresponding off-diagonal correlations, confirming that each construct is indeed distinct from the others. Additionally, the significance levels marked by asterisks (***), indicating $p<0.001$, underscore the statistical significance of the correlations. Overall, the table effectively demonstrates that the model possesses robust discriminant validity, supporting the individual distinctiveness of each construct within the study.

Table 6. Discriminant Validity Test

Latent variables	**1**	**2**	**3**	**4**	**5**	**6**
Online communication	0.727					
Information transfer	0.493 ***	0.756				
Resource exchange	0.459 ***	0.565 ***	0.754			
Social Capital	0.519 ***	0.481 ***	0.490 ***	0.764		
Technology Stress	0.515 ***	0.542 ***	0.477 ***	0.462 ***	0.748	
Work performance	0.521 ***	0.561 ***	0.534 ***	0.601 ***	0.525 ***	0.749
Note: The diagonal is the square root of the corresponding dimension AVE ***: p<0.001						

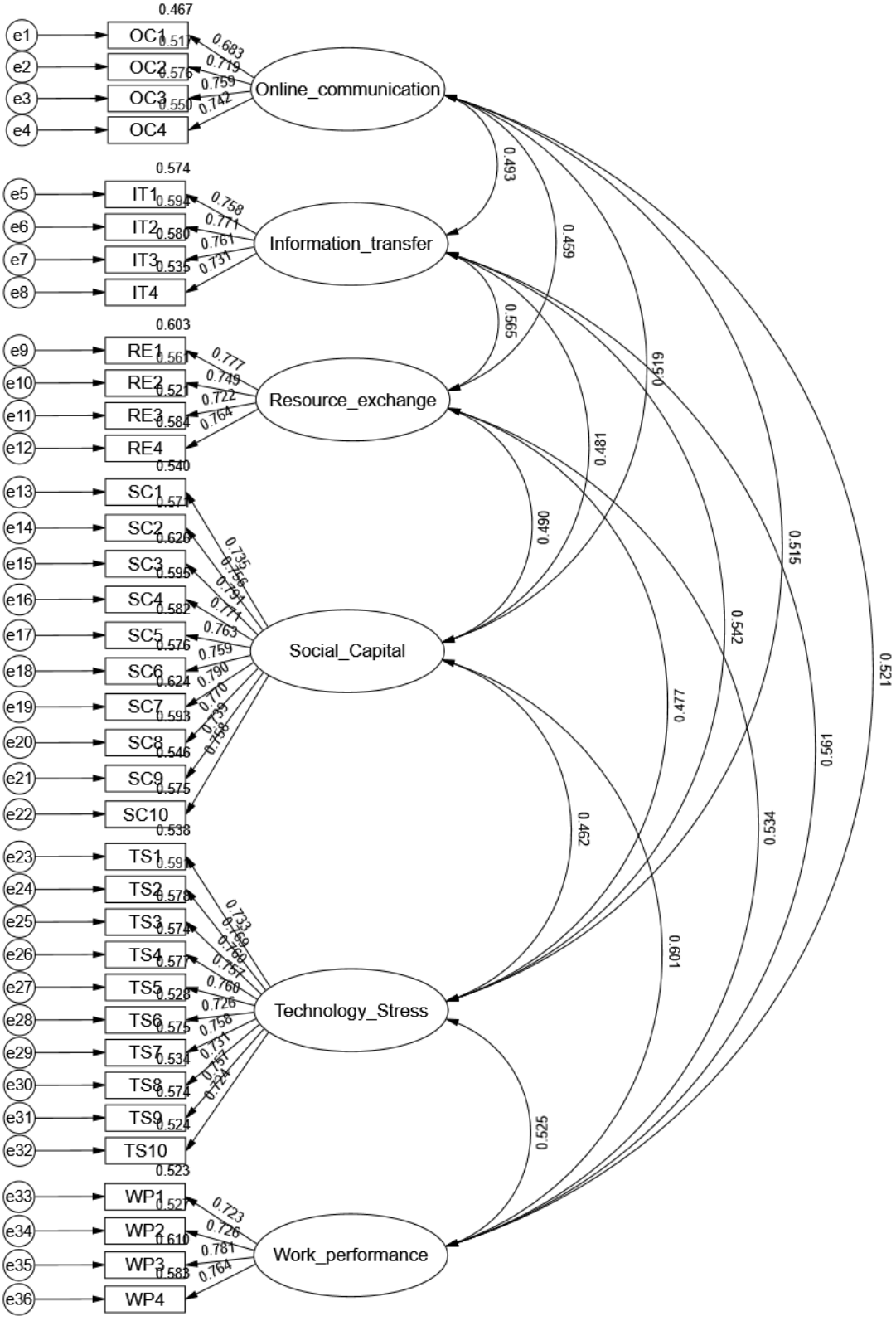

Figure 1. CAF for the structural model

Structural Equation Model

Table 7 presents various indices to evaluate the goodness of fit for a structural equation model. These metrics assess how well the hypothesized model reproduces the observed data. The indices include Chi-Square to degrees of freedom ratio (χ2/df), Root Mean Square Error of Approximation (RMSEA), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Normed Fit Index (NFI), Tucker-Lewis Index (TLI), and Comparative Fit Index (CFI). Each index is compared against established reference standards to determine model adequacy. The results show that all indices fall within acceptable ranges: χ2/df is 1.445, RMSEA is 0.027, GFI is 0.932, AGFI is 0.922, NFI is 0.935, TLI is 0.977, and CFI is 0.979. These values suggest that the model provides a very good fit to the data, indicating that the hypothesized model structure adequately reflects the relationships among the variables studied.

Table 7. Model Fit Metrics

Fit index	χ2/df	RMSEA	GFI	AGFI	NFI	TLI	CFI
Reference standards	<3	<0.08	>0.9	>0.85	>0.9	>0.9	>0.9
Result	1.445	0.027	0.932	0.922	0.935	0.977	0.979

Table 8 details the results of hypothesis testing for paths within a structural equation model analyzing the relationships among various latent variables: Online Communication (OC), Information Transfer (IT), Resource Exchange (RE), Social Capital (SC), Technology Stress (TS), and Work Performance (WP). The table includes path estimates, standardized coefficients (β), standard errors (S.E.), critical ratios (C.R.), and p-values (P), along with the support status of each hypothesis.

The results indicate that all proposed hypotheses (H1 through H11) are supported, as evidenced by the significance of the paths:

H1, examining the impact of OC on WP, shows a positive effect with a coefficient of 0.127 and is statistically significant ($p = 0.017$).

H2 and H3 demonstrate significant positive relationships from OC to SC and TS, respectively, with high critical ratios indicating strong effects.

H4 through H6 focus on the effects of IT on SC, WP, and TS, all supported by significant p-values ($p < 0.001$).

H7 and H8 explore the influence of RE on SC and TS, also finding significant support.

H9, assessing RE's impact on WP, is supported with a β of 0.152 and a p-value of 0.004.

H10 and H11 test the influence of SC and TS on WP, respectively, both showing significant positive impacts with β values over 0.145 and p-values indicating strong statistical significance ($p < 0.001$).

This analysis underscores the interconnectivity and significance of various communication and social variables in influencing work performance, with the paths demonstrating how different types of communication and social interactions impact the broader dynamics of technology stress and work performance within organizational settings. The high critical ratios and significant p-values across all hypotheses confirm the robustness of the model and the reliability of the findings in explaining the relationships among the variables studied.

Table 8. Structural Equation Model Path Test

Hypothesis	Path	Estimate	β	S.E.	C.R.	P	Results
H1	**OC→WP**	0.129	0.127	0.054	2.379	0.017	Supported
H2	**OC→SC**	0.357	0.322	0.057	6.303	***	Supported
H3	**OC→TS**	0.316	0.294	0.054	5.866	***	Supported
H4	**IT→SC**	0.187	0.195	0.051	3.694	***	Supported

H5	**IT→WP**	0.168	0.191	0.049	3.458	***	Supported
H6	**IT→TS**	0.280	0.300	0.050	5.603	***	Supported
H7	**RE→SC**	0.230	0.236	0.050	4.565	***	Supported
H8	**RE→TS**	0.168	0.178	0.048	3.511	***	Supported
H9	**RE→WP**	0.136	0.152	0.047	2.912	0.004	Supported
H10	**SC→WP**	0.277	0.302	0.045	6.114	***	Supported
H11	**TS→WP**	0.137	0.145	0.046	2.986	0.003	Supported

Note: OC:Online communication; IT: Information transfer; RE: Resource exchange; SC: Social Capital; TS: Technology Stress; WP: Work performance.
***: p<0.001

Table 9 presents the results of hypothesis testing for the mediation effects within a structural equation model that examines indirect relationships involving Online Communication (OC), Information Transfer (IT), Resource Exchange (RE), Social Capital (SC), Technology Stress (TS), and Work Performance (WP). This table assesses the size of the mediation effect, the standard error (SE), and the 95% confidence intervals (Bias-Corrected 95%CI) for each mediation path.

The results demonstrate that all proposed mediation hypotheses (H12 through H17) are supported:

H12 tests the indirect effect of OC on WP through SC, showing an effect size of 0.099, which is significant as the confidence interval (0.050 to 0.170) does not include zero.

H13 and H14 assess the mediation of SC in the relationship between IT and RE on WP, respectively, with effect sizes of 0.052 and 0.064. Both hypotheses are supported with confidence intervals that do not encompass zero, indicating significant mediation.

H15, H16, and H17 explore the mediation effect of TS on the relationships between OC, IT, RE and WP, respectively. The effect sizes range from 0.023 to 0.043, with all hypotheses showing significant mediation as their confidence intervals (ranging from 0.003 to 0.107) also exclude zero.

These findings suggest that both Social Capital and Technology Stress serve as significant mediators in the pathways from various types of communication and resource exchanges to Work Performance, substantiating the interconnected roles these constructs play in enhancing or impacting work outcomes in organizational settings. The application of bootstrap methods for testing these effects provides robust support for the mediation paths, ensuring that the results are not due to sampling variability.

Table 9. Mediation Effect Bootstrap Test

Hypothesis	Mediation path	Effect size	SE	Bias-Corrected 95%CI		Results
H12	**OC→SC→WP**	0.099	0.031	0.050	0.170	Supported
H13	**IT→SC→WP**	0.052	0.022	0.017	0.112	Supported
H14	**RE→SC→WP**	0.064	0.024	0.025	0.123	Supported
H15	**OC→TS→WP**	0.043	0.024	0.006	0.107	Supported
H16	**IT→TS→WP**	0.038	0.020	0.006	0.090	Supported
H17	**RE→TS→WP**	0.023	0.015	0.003	0.063	Supported

Note: OC:Online communication; IT: Information transfer; RE: Resource exchange; SC: Social Capital; TS: Technology Stress; WP: Work performance.

Figure 2. presents the relationship among online communication, information transfer, resource exchange and work performance. In this way, this model identifies the mediation role of social capital and technology stress towards work performance.

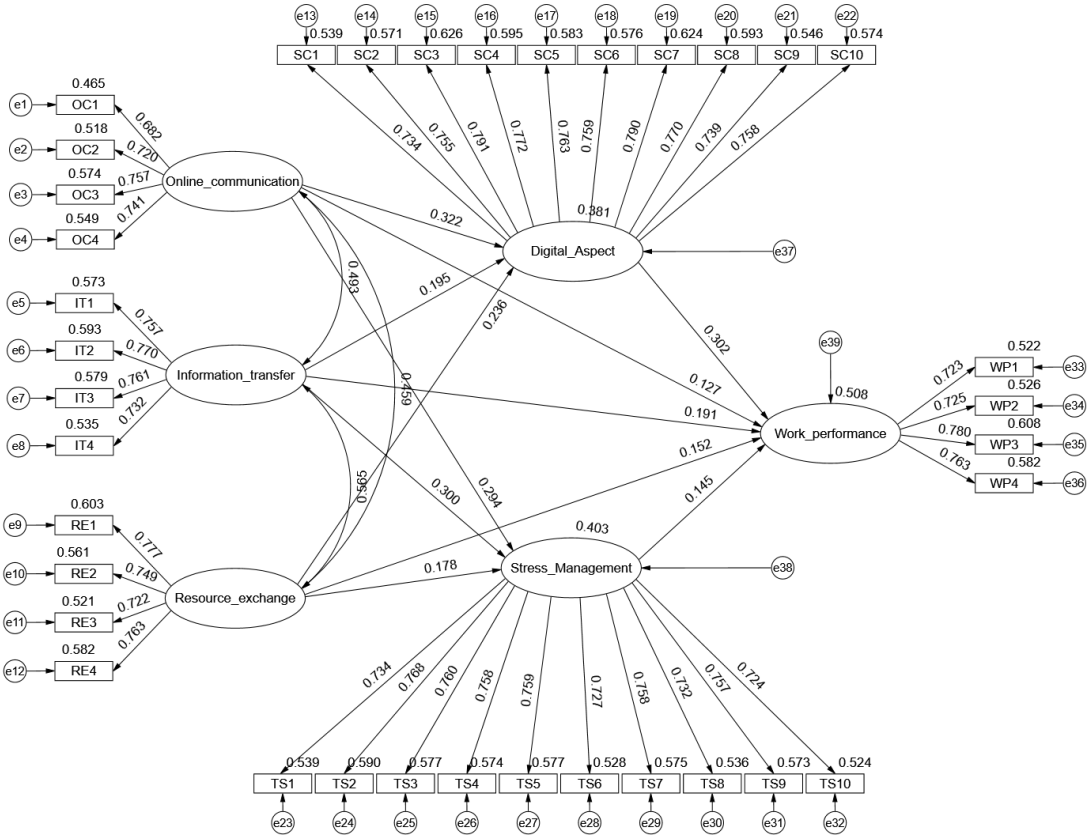

Figure 2. Structural equation model diagram

DISCUSSION AND CONCLUSION

The path analysis conducted in this study offers a comprehensive understanding of the dynamics between online communication, information transfer, resource exchange, social capital, technology stress, and work performancewithin the context of higher education. The results demonstrate that online communication, information transfer, and resource exchange significantly enhance work performance both directly and through the mediation of social capital and technology stress. Notably, the positive direct effects of online communication on work performance (H1) and the significant mediation roles of SC in the pathways from online communication, information transfer, and resource exchange to work performance (H12, H13, H14) highlight how robust professional networks and effective communication enhance educational effectiveness. Furthermore, while technology stress generally poses challenges, its mediation effect suggests that manageable levels of stress can also encourage innovation and adaptation among educators. These findings suggest that by leveraging social media effectively to enhance communication and resource sharing, and by managing the associated technology stress, educational institutions can significantly improve teaching outcomes. This strategic approach can not only enhance the teaching performance but also foster a more collaborative and engaging educational environment.

Theoretical Implications

Drawing on media synchronicity theory, social capital theory, and the integrated marketing communications theory, this comprehensive framework provides a nuanced understanding of how digital platforms can be harnessed to enhance teaching performance in higher education.

Media synchronicity theory posits that communication media should match the communication needs of tasks to enhance effectiveness (Dennis et al., 2008). In the context of this study, the positive effects of online communication on work performance validate MST's emphasis on choosing appropriate digital tools that

support immediate and synchronous exchanges to optimize task performance. This finding aligns with past research suggesting that media synchronicity can enhance team performance in educational settings by facilitating better alignment between communication needs and media capabilities. However, unlike some prior studies which highlighted challenges in achieving synchronicity, our findings suggest that effective use of social media tools can overcome these barriers, enhancing educational delivery.

This study underscores the role of social capital as a mediator, suggesting that digital interactions can build valuable networks that foster collaborative and supportive educational environments. This extends the findings of, who view social capital as a critical resource in achieving organizational goals. However, our study further elaborates on the dimensionality of social capital in digital settings, where both the structural and relational components of social capital are enhanced through systematic use of digital communication tools, contributing to improved teaching outcomes (Aguilar et al., 2021)

The integration of integrated marketing communications theory with digital communication strategies in educational settings, as suggested by our findings, shows that a cohesive communication strategy across various digital platforms enhances the educational narrative and engagement. This study supports the notion that integrated marketing communications theory can be effectively adapted to the educational sector, where consistent messaging and tailored content distribution via social media can significantly enhance teaching performance. Unlike previous applications of integrated marketing communications theory which focused primarily on commercial outcomes, our findings reveal that integrated marketing communications theory principles can also effectively enhance educational outcomes by fostering a unified communication strategy that addresses diverse learner needs and preferences.

In summary, by integrating media synchronicity theory, social capital theory, and the integrated marketing communications theory, this study not only supports but also expands upon the existing literature by demonstrating how these theoretical frameworks can be adapted to the digital transformation of educational settings. Each theory contributes a unique perspective on the utilization of digital tools, emphasizing the importance of matching communication capabilities with task requirements, leveraging social networks for collaborative advantage, and maintaining consistent and strategically tailored communication to enhance educational effectiveness. These insights provide a robust framework for educational institutions aiming to harness digital platforms for improved performance and stakeholder engagement.

Practical Implications

The results of this study also hold significant managerial implications for stakeholders in the educational sector, particularly in how digital tools and social media are integrated into teaching strategies. These implications are vital for administrators, faculty members, IT departments, and policy-makers committed to enhancing educational outcomes.

Administrators should consider the study's findings on the positive impacts of online communication, information transfer, and resource exchange on work performance and social capital. These results suggest that encouraging the use of social media and digital platforms can directly enhance teaching effectiveness and foster a collaborative academic environment. School administrators can leverage this insight by providing training and resources that encourage faculty to integrate digital communication tools into their teaching practices effectively. Additionally, recognizing the role of social capital as a mediator suggests that institutions should foster an environment that promotes the building of professional networks and communities within the faculty, potentially through formal programs and initiatives that encourage collaboration and resource sharing.

For faculty members, understanding that effective digital communication correlates with improved work performance could encourage more proactive engagement with social media platforms tailored to educational needs. Faculty should be encouraged to participate in workshops and training sessions that not only boost their digital communication skills but also educate them on the strategic use of these platforms to enhance student engagement and learning outcomes.

IT departments should focus on providing robust, user-friendly digital tools that align with the educational needs highlighted by Media Synchronicity Theory. This includes ensuring that communication tools support

both synchronous and asynchronous interactions effectively and are reliable and straightforward to use. Additionally, considering that technology stress serves as a mediator influencing work performance, IT support should also include technical support and training that aim to minimize stress associated with the adoption of new technologies.

Policymakers within educational institutions should consider developing and implementing policies that support the integration of digital tools in a manner that enhances social capital and reduces technology stress. This could include policies that address workload management to mitigate the negative aspects of technology stress, and data privacy and security to ensure that the digital engagement of both faculty and students remains protected.

In conclusion, this study's insights should guide the strategic development and implementation of digital tools within educational settings, emphasizing the enhancement of teaching effectiveness through improved communication, collaboration, and reduced technology-induced stress. These strategies not only aim to improve individual faculty performance but also to elevate the overall educational standards and outcomes of the institution.

CONCLUSION

This study examined the intricate relationships between online communication, information transfer, resource exchange, social capital, technology stress, and work performance within the context of higher education using structural equation modeling. Results indicate that online communication, information transfer, and resource exchange significantly enhance work performance both directly and through the mediation of social capital and technology stress. Specifically, online communication was found to positively impact work performance and was further mediated by social capital, suggesting that robust professional networks fostered through social media significantly enhance teaching effectiveness. Additionally, information transfer and resource exchange were shown to positively influence both social capital and technology stress, with subsequent positive effects on work performance, highlighting the importance of resource sharing and information dissemination in the educational process. Technology stress, while typically viewed as a negative outcome, was shown to have a nuanced role, suggesting that manageable levels of stress could stimulate innovation and adaptation among educators.

This study makes several notable contributions to the existing literature on digital media use in education. Firstly, it integrates media synchronicity theory, Social capital theory, and integrated marketing communications theory to provide a multifaceted view of how digital tools can be strategically used to enhance educational outcomes. The study also extends the application of these theories in an educational context, particularly highlighting the role of social capital and technology stress as mediators in the relationship between digital communication and teaching performance. Additionally, by demonstrating the direct and indirect impacts of digital tool use on work performance, the research provides empirical evidence supporting the strategic integration of social media in teaching practices, thereby enhancing both the efficiency and efficacy of educational delivery.

Despite its insights, this study is not without limitations. One significant limitation is the reliance on self-reported data, which may be subject to bias. Additionally, the study's focus on higher education institutions in Sichuan Province may limit the generalizability of the findings to other regions or educational levels. The cross-sectional design of the study also means that the findings are limited to a specific point in time and do not account for changes over longer periods, which could be crucial for understanding the long-term impacts of social media use in education. Future research should address these limitations by incorporating longitudinal data to capture the evolution of digital tool impacts over time. Expanding the geographical scope of the study to include diverse educational settings and cultures could enhance the generalizability of the findings. Further research could also explore the impact of individual differences, such as digital literacy and personal attitudes towards technology, on the effectiveness of social media as educational tools. Additionally, qualitative studies could provide deeper insights into the subjective experiences of educators and students regarding the use of digital tools in education, offering a more nuanced understanding of the quantitative results obtained in this

study.

In conclusion, while this study provides valuable insights into the strategic use of digital communication tools in education, acknowledging its limitations and considering future research directions will be crucial for continuing to enhance educational practices and outcomes in the digital age.

Data Availability Statement

The datasets presented in this article are not readily available because they involve the interests of collaborators, as well as some privacy issues, and some data are confidential. However, further individual scholars or experts are welcome to request these datasets for academic references or other needs; requests to access these datasets should be directed to chunyang.Yu@rmutto.ac.th

Author Contributions

Yu, conceptualization and writing—original draft preparation, methodology, formal analysis.

Chonlavit Sutunyarak, writing—review and editing.

All authors have read and agreed to the published version of the manuscript.

Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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