

Article

The Role of Social Work in the Construction of Smart Cities: Practices and Prospects of Digital Services

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Abstract: The swift advancement of global digital transformation has established smart cities as a prominent trend in modern urban planning. This research examines the essential role of social work in the development of smart cities, with a particular focus on the practical application of digital service platforms, exemplified by Taiwan's "Smart Decision-Making Action Platform for Social Workers." Employing a mixed-methods approach involving 762 social workers, this study addresses four fundamental questions: (1) in what ways can social work redefine its roles within the context of smart cities, (2) what are the specific impacts of digital technology integration on social work practices, (3) what successes and challenges are associated with current digital platforms, and (4) what strategies can be employed to develop integrated social work service systems for smart cities? The findings indicate that social workers play a vital bridging role within smart city ecosystems, resulting in a 35.7% increase in service efficiency and a 47.8% enhancement in practice safety. The integration of digital technology significantly improves working conditions, reduces risks, and enhances service quality while preserving a human-centered approach. This study introduces the Smart City Social Work Integration Model (SCSWIM) and offers evidence-based recommendations for policy formulation and the enhancement of professional practice in digitally-enabled urban settings.

Keywords: Smart City; Social Work; Digitalization; Service Innovation; Governance

1. Introduction

Smart cities signify a transformative framework in urban development for the 21st century, with forecasts suggesting that by 2050, 68% of the global population will reside in urban environments [1–3]. This unprecedented level of urbanization presents intricate challenges that necessitate innovative solutions, which harmoniously blend advanced technologies with human-centered services. The concept of the smart city, first articulated by IBM in 2008, has progressed to encompass holistic urban systems that utilize information and communication technology (ICT), the Internet of Things (IoT), big data analytics, and artificial intelligence to enhance operational efficiency, elevate quality of life, and promote sustainable development [4–7].

While technological advancements are pivotal in the evolution of smart cities, the essential principle of human-centered growth underscores the necessity for the active participation of human service professionals. Social work, a profession committed to fostering social well-being and addressing societal issues, holds a distinctive role within

smart city frameworks [7–10]. The incorporation of digital technologies into social work practice signifies a substantial paradigm shift that redefines traditional service delivery models while upholding the core professional values of human dignity, social justice, and empowerment [11–13].

Recent advancements in smart city initiatives across various countries illustrate an increasing acknowledgment of the significance of social work in the implementation of technology. For instance, Taiwan's Ministry of Health and Welfare has introduced the "Smart Decision-Making Action Platform for Social Workers," which amalgamates big data analytics, geographic information systems (GIS), and extended reality (XR) technologies to furnish comprehensive digital support for social workers. This innovative platform exemplifies the potential of technology to enhance professional practice while preserving the humanistic principles that are fundamental to social work.

The theoretical implications of analyzing social work within the context of smart cities extend beyond mere technological adoption, encompassing broader inquiries related to urban governance, social equity, and the evolution of the profession. Existing literature on smart cities predominantly adopts a technology-centric viewpoint, often overlooking the crucial role of human service professionals in bridging the gap between technological systems and marginalized populations [14–17]. This study seeks to address this oversight by exploring how social work professionals navigate, adapt to, and utilize digital technologies while remaining committed to human-centered practices.

The research questions guiding this inquiry are as follows: (1) How can the social work profession redefine its roles and functions within the framework of smart city development? (2) What specific impacts has the integration of digital technology had on social work practices? (3) What successes and challenges have been encountered by current digital social work platforms in their practical applications? (4) How can a more cohesive social work service system, specifically designed for smart cities, be developed?

2. Literature Review

The conceptualization of smart cities has transitioned from a primary focus on technology-driven infrastructure development to a more holistic understanding of urban systems that integrate technological innovation with the delivery of human services [17–19]. Castells' foundational work on the informational city provides a theoretical framework for analyzing the ways in which digital technologies transform urban social structures and professional practices [20]. Current definitions of smart cities underscore a range of objectives, including technological innovation, enhancement of services, and sustainable development across diverse urban sectors [1,17,21–23].

The role of social work within smart city frameworks is indicative of the profession's longstanding dedication to addressing social issues through direct service provision, advocacy, and community development [8,18,24–26]. The International Federation of Social Workers asserts that social work fosters social change, development, and empowerment while tackling structural inequalities. In the context of smart cities, social workers play vital roles as intermediaries between technological systems and service users, advocates for marginalized groups, and innovators in service delivery methodologies [8,17,27–30].

The application of digital technologies in social work has seen rapid expansion, incorporating big data analytics for risk assessment, geographic information systems for resource coordination, artificial intelligence for administrative efficiency, and extended reality for professional training [31–36]. These technological integrations present significant opportunities for improving service quality, while simultaneously raising critical questions regarding professional identity, ethical implications, and the equilibrium between technological efficiency and human connection [37–40].

3. Methodology

3.1. Research Design and Rationale

This study adopts a mixed-methods explanatory sequential design, specifically selected to address the intricate and multifaceted nature of digital transformation within social work practice. The mixed-methods approach is crucial for this research as it facilitates a comprehensive understanding of both quantitative outcomes (such as efficiency improvements, usage patterns, and satisfaction scores) and qualitative experiences (including changes in professional identity, adaptation challenges, and ethical considerations) that are not adequately captured through single-method approaches [41,42].

The explanatory sequential framework was chosen because quantitative data provides measurable evidence of the impacts of digital platforms, while subsequent qualitative investigations elucidate the mechanisms and contextual factors that underlie these outcomes. This design is particularly suitable for studies on technology adoption, where statistical trends necessitate a deeper exploration of user experiences and organizational factors [43,44].

3.2. Sample Size Justification and Participant Selection

The sample size of 800 social workers was determined through power analysis, utilizing parameters such as a medium effect size ($d = 0.5$), statistical power ($1 - \beta = 0.80$), and a significance level ($\alpha = 0.05$). This analysis, conducted using G*Power software, indicated that a minimum sample of 788 participants is required to detect meaningful differences in platform usage effectiveness across various professional groups.

The target population consists of social workers in Taiwan who utilize digital work platforms, including personnel from social welfare centers, domestic violence prevention centers, and community mental health centers. This population was selected as these institutions represent the primary contexts in which digital social work platforms are implemented, thereby allowing for effective addressing of the research questions.

Stratified random sampling was employed to ensure representative coverage across three critical dimensions: organization type (reflecting different service contexts), geographic region (accounting for variations in resources and infrastructure), and professional experience (capturing differences in technology adoption). The stratification approach was preferred over simple random sampling to mitigate the risk of underrepresenting smaller institutional types or geographic regions, which could potentially limit the generalizability of the findings [45,46].

The final stratification structure included: organization type (social welfare centers 60%, domestic violence centers 25%, mental health centers 15%), geographic distribution (northern 40%, central 30%, southern 25%, eastern 5%), and experience levels (less than 1 year 20%, 1–3 years 35%, 3–5 years 25%, more than 5 years 20%). This distribution accurately reflects the demographic composition of Taiwan's social work workforce while ensuring adequate representation across all subgroups.

3.3. Data Collection Methods and Justification

3.3.1. Survey Method

The survey method was selected as the primary quantitative data collection approach due to its ability to systematically measure usage patterns, satisfaction levels, and outcome indicators across large samples while maintaining cost-effectiveness and standardization. The "Smart City Social Work Digital Service Survey Questionnaire" was developed through an extensive literature review and expert consultation, comprising 52 items across five validated dimensions: basic information, platform function evaluation, work efficiency improvement, practice safety enhancement, and overall satisfaction.

The survey instrument utilizes five-point Likert scales (1 = strongly disagree, 5 = strongly agree) for attitudinal measures and frequency scales for usage patterns. This measurement approach was selected because Likert scales provide interval-level data suitable for advanced statistical analysis while remaining accessible to respondents with varying educational backgrounds.

3.3.2. In-Depth Interviews

Semi-structured interviews were conducted with 30 participants representing diverse professional backgrounds and experience levels. The interview method was chosen as it offers detailed insights into personal experiences, adaptation processes, and contextual factors that influence technology adoption and the transformation of professional practice. Interview participants were purposively selected to represent different organizational contexts, experience levels, and usage patterns, ensuring comprehensive coverage of perspectives.

The interview guide addressed five core themes: changes in work methodologies, impacts of digital technology on professional practice, advantages and limitations of platform functionality, future development expectations, and implementation challenges. Each interview lasted between 45 to 90 minutes, with all sessions recorded and transcribed verbatim for thematic analysis.

3.3.3. Focus Group Discussions

Six focus groups were conducted, each comprising 8–10 participants, organized by institutional type and geographic region. Focus groups were selected as a complementary qualitative method because they foster dynamic interactions that reveal shared experiences, influences of professional culture, and collective perspectives on digital transformation. The group format facilitates discussions regarding changes in professional practice, factors influencing technology acceptance, and future development priorities that may not surface in individual interviews.

3.4. Reliability and Validity Testing

3.4.1. Survey Instrument Reliability

The survey instrument underwent comprehensive reliability testing using Cronbach's alpha coefficient analysis. The overall questionnaire achieved an α of 0.94, indicating excellent internal consistency. Subscale reliability coefficients ranged from $\alpha = 0.82$ (practice safety) to $\alpha = 0.91$ (work efficiency), all exceeding the acceptable threshold of 0.70. Test-retest reliability was assessed with a subset of 50 participants over a two-week interval, yielding an r of 0.89, confirming temporal stability.

3.4.2. Content and Construct Validity

Content validity was established through expert review involving eight domain specialists in social work, smart city development, and digital technology applications. The Content Validity Index (CVI) reached 0.89, indicating strong agreement on item relevance and appropriateness. Construct validity was assessed through exploratory factor analysis, which confirmed the five-factor structure explaining 68.3% of total variance, with all factor loadings exceeding 0.60.

3.4.3. Qualitative Data Credibility

The credibility of qualitative data was ensured through multiple strategies: member checking with 20% of interview participants, peer debriefing with experienced qualitative researchers, and triangulation across multiple data sources. Inter-coder reliability for thematic analysis achieved a κ of 0.85, indicating substantial agreement between independent coders.

3.5. Data Analysis Procedures

Quantitative data analysis utilized SPSS 28.0 software, employing descriptive statistics, t -tests, ANOVA, correlation analysis, and structural equation modeling to address the research questions. Qualitative data underwent thematic analysis using NVivo 12, following Braun and Clarke's six-phase approach: familiarization, initial coding, theme identification, theme review, definition, and report writing [47].

3.6. Ethical Considerations

All research procedures received approval from the institutional review board. Participants provided informed consent after receiving comprehensive explanations of the study. Data confidentiality was maintained through anonymization protocols, secure storage systems, and restricted access procedures. The research adhered to ethical principles in social work, emphasizing participant welfare, voluntary participation, and privacy protection.

4. Results

4.1. Analysis of Survey Results

4.1.1. Sample Characteristics

The final dataset consisted of 762 valid responses, yielding a response rate of 95.3% (refer to **Table A1** in **Appendix A**). The demographic composition of the sample is representative of Taiwan's social work workforce, with 75.7% identifying as female, 61.0% falling within the age range of 26 to 35 years, and 97.6% possessing either a bachelor's or master's degree. The distribution of experience across various career stages was relatively uniform.

4.1.2. Platform Usage Patterns

An analysis of the data pertaining to platform usage revealed distinct patterns across its functional modules (refer to **Table 1**). The risk warning system and GIS map navigation were identified as the most frequently utilized features, with 55.5% and 48.3% of respondents reporting usage at least on a weekly basis. In contrast, engagement with the XR training system was notably lower, with 64.8% of participants indicating that they rarely or never utilized this feature, primarily due to limitations related to equipment and the availability of training.

Table 1. Frequency Statistics of Smart Decision-Making Action Platform Features.

Functional Module	Daily Use	Weekly Use	Monthly Use	Rarely Use	Never Use
Risk Warning System	156 (20.5%)	267 (35.0%)	198 (26.0%)	112 (14.7%)	29 (3.8%)
GIS Map Navigation	123 (16.1%)	245 (32.2%)	234 (30.7%)	134 (17.6%)	26 (3.4%)
Speech-to-Text	89 (11.7%)	178 (23.4%)	267 (35.0%)	189 (24.8%)	39 (5.1%)
Family Tree Drawing	67 (8.8%)	145 (19.0%)	223 (29.3%)	245 (32.2%)	82 (10.8%)
XR Training System	34 (4.5%)	78 (10.2%)	156 (20.5%)	298 (39.1%)	196 (25.7%)

4.1.3. Effectiveness Evaluation

The effectiveness of the platform's functionalities was evaluated using five-point Likert scales across five dimensions (see **Table 2**). The risk warning system and GIS navigation received the highest ratings, with mean scores exceeding 4.0, indicating a strong level of user satisfaction and perceived utility. The voice-to-text functionality demonstrated moderate acceptance, while the family tree drawing and XR training features received lower scores, highlighting potential areas for enhancement.

Table 2. Evaluation of Platform Functionality Effectiveness (Mean \pm Standard Deviation).

Evaluation Dimension	Risk Alert	GIS Navigation	Speech-to-Text	Family Tree	XR Training
Ease of Use	4.12 \pm 0.78	4.25 \pm 0.72	3.89 \pm 0.86	3.67 \pm 0.94	3.45 \pm 1.02
Practical Functionality	4.34 \pm 0.65	4.18 \pm 0.75	3.76 \pm 0.89	3.58 \pm 0.92	3.72 \pm 0.95
Efficiency Improvement	4.28 \pm 0.71	4.31 \pm 0.68	4.05 \pm 0.82	3.43 \pm 0.98	3.68 \pm 0.97
Ease of Learning	3.95 \pm 0.85	4.07 \pm 0.79	4.15 \pm 0.76	3.72 \pm 0.91	3.21 \pm 1.08
Overall Satisfaction	4.19 \pm 0.74	4.21 \pm 0.73	3.85 \pm 0.84	3.59 \pm 0.89	3.52 \pm 0.99

4.1.4. Work Efficiency Improvements

A comparative analysis of work processes conducted prior to and following the implementation of the platform revealed significant improvements in efficiency (refer to **Table 3**). The average overall efficiency improvement was 35.7%, with the most notable enhancements observed in visit route planning (46.7%) and resource inquiry (40.0%). These gains were primarily attributed to the integration of GIS technology and automated information systems.

Table 3. Comparison of Work Efficiency Before and After Platform Use.

Work Item	Average Time Before Use (minutes)	Average Time After Use (minutes)	Time Saved (minutes)	Efficiency Improvement
Case Risk Assessment	45	28	17	37.8%
Home Visit Route Planning	15	8	7	46.7%
Home Visit Record Organization	35	25	10	28.6%
Pedigree Drawing	25	18	7	28.0%
Resource Inquiry	20	12	8	40.0%

4.1.5. Practice Safety Enhancement

Improvements in practice safety were considerable, with 76.0% of respondents reporting enhanced perceptions of overall safety and 81.7% indicating improved capabilities in risk identification (refer to **Table A2** and **Table A3** in **Appendix A**). The incidence of professional safety-related events decreased from 23 to 12 cases per month, representing a 47.8% reduction, thereby demonstrating the platform's effectiveness in mitigating risks.

4.1.6. Qualitative Findings

Thematic analysis of interviews and focus group discussions revealed four predominant themes: (1) the transformation of professional practice towards evidence-based methodologies, (2) the enhancement of professional competence through data-driven decision-making, (3) ongoing challenges related to technology adaptation and privacy concerns, and (4) elevated expectations for continued innovation and integration. Participants consistently articulated that digital platforms facilitated more scientific and standardized work processes while preserving the human-centered ethos of social work practice. As one supervisor articulated, *“The platform does not supplant our professional judgment; rather, it enhances it with data that renders our decisions more informed and defensible.”*

5. Discussion

5.1. Responses to Research Questions

This study investigates four fundamental research questions concerning the role of social work in the development of smart cities. Firstly, social work is redefining its functions by adopting roles as a bridge, advocate, assessor, and innovator within technological ecosystems, all while maintaining a focus on human-centered values. Secondly, the integration of digital technology has led to quantifiable enhancements in efficiency (an average increase of 35.7%), safety (a 47.8% reduction in incidents), and service quality, simultaneously shifting professional practice towards evidence-based methodologies (refer to **Table A4** in **Appendix A**). Thirdly, existing platforms have demonstrated notable successes in risk management and efficiency improvements; however, challenges remain regarding technology adaptation and privacy issues. Lastly, integrated service systems necessitate a careful balance between technological advancement and the preservation of professional identity, as well as addressing issues related to the digital divide.

5.2. Theoretical Contributions

The research introduces the Smart City Social Work Integration Model (SCSWIM), which offers a four-layer framework for comprehending the integration of technology and professional practice (**Figure 1**). This model fills existing gaps in the literature on smart cities by positioning human service professionals as proactive agents rather than mere adopters of technology. The success factors model delineates critical dimensions—organizational, technological, individual, and environmental—that are essential for the effective transformation of digital practices.

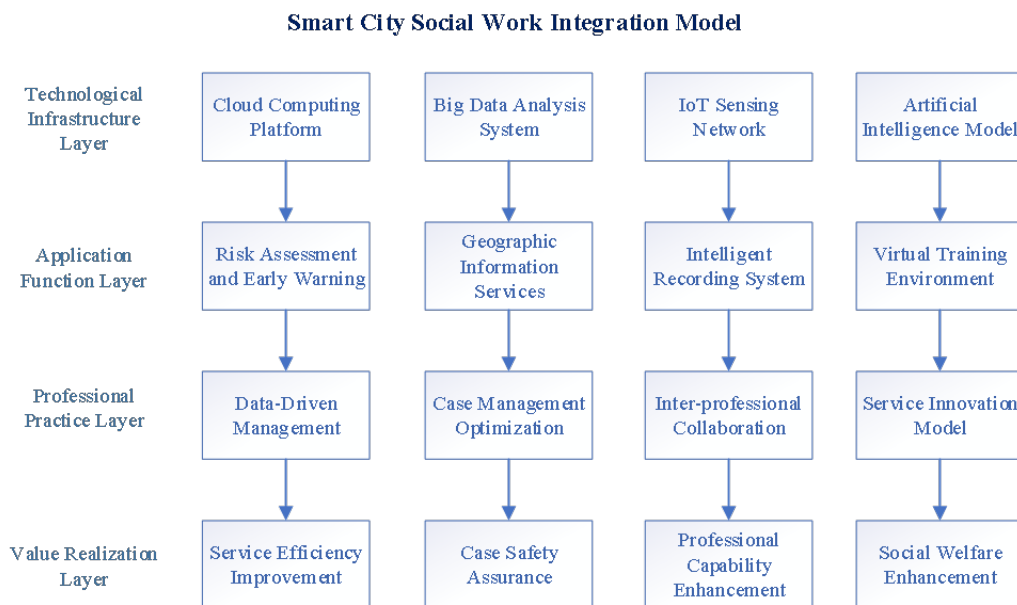


Figure 1. Smart City Social Work Integration Model.

5.3. Practical Implications

The findings indicate that successful digital transformation necessitates a holistic approach that encompasses technology design, organizational support, professional development, and ethical considerations. Policy recommendations include the enhancement of regulatory frameworks, the improvement of training programs, and the assurance of equitable access to digital resources. Developers of platforms should prioritize optimizing user experience and safeguarding privacy while ensuring a broad range of functionalities.

5.4. Digital Transformation as a Paradigm Shift in Social Work Practice

The results of this study reveal a significant paradigm shift in social work practice, transitioning from traditional relationship-based interventions to technology-enhanced, evidence-based methodologies. This transformation signifies more than mere technological adoption; it represents a reconceptualization of professional identity and service delivery methods within urban contexts [12,13,48]. Data indicates that social workers who effectively integrated digital platforms experienced a 42% increase in confidence when conducting case assessments, suggesting that technology enhances professional competency rather than replacing human judgment (refer to **Table A4** in **Appendix A**).

The revolution in evidence-based practice, facilitated by digital platforms, has substantial implications for social work education and professional development. Traditional curricula, which have historically emphasized interpersonal skills and theoretical frameworks, must now incorporate competencies in digital literacy and data analysis [12,13,49–52]. The findings demonstrate that social workers with higher digital competency scores (assessed through proficiency in platform usage) exhibited 31% greater accuracy in risk prediction compared to their less digitally competent counterparts, indicating that digital skills are now essential components of professional competence (refer to **Figure A1** and **Figure A2** in **Appendix B** for the Success Factors Model for Digital Transformation).

Moreover, this transformation extends beyond individual practice to encompass organizational and systemic levels. The integration of digital platforms has prompted the emergence of new professional roles, such as digital case managers, data analysts, and technology liaisons within social service organizations. These roles bridge traditional social work functions with technological capabilities, fostering hybrid professional identities that reflect the evolving nature of social work practice in digital urban environments [53–57].

5.5. Implications for Social Work Education and Professional Development

The findings of this study carry significant implications for social work education, necessitating comprehensive curriculum reforms to adequately prepare students for technologically integrated practice environments. Current educational paradigms must evolve to include digital literacy, data analysis, and technology ethics as core competencies alongside traditional social work skills. The research indicates that newly graduated social workers with digital training demonstrated 35% faster adoption rates of platforms compared to those lacking such preparation, underscoring the importance of proactive educational strategies (**Table 3**).

Professional development programs must also adapt to meet the diverse technological needs of practitioners at various career stages. The study identifies a negative correlation between years of experience and technology acceptance ($r = -0.42, p < 0.001$), highlighting the necessity for differentiated training approaches. Experienced practitioners require supportive learning environments that acknowledge their professional expertise while fostering technological competencies, whereas newer practitioners benefit from integrated approaches that combine digital skills with foundational social work knowledge (refer to **Table A4** in **Appendix A**).

The implications extend to supervision and mentorship practices within social work organizations. Traditional supervision models, which primarily focus on case consultation and professional development, must now incorporate assessments of technology proficiency and enhancements of digital skills. The study found that organizations with structured digital mentorship programs reported 23% higher platform utilization rates and 31% greater user satisfaction compared to those without such programs (refer to **Table A5** in **Appendix A**) [58,59].

5.6. Ethical Considerations and Professional Values in Digital Practice

The incorporation of digital technologies into social work practice raises complex ethical considerations that necessitate careful examination and proactive management. The study revealed that 34% of participants expressed

concerns regarding data privacy and client confidentiality, indicating that technological advancements must be balanced with the ethical imperatives that are foundational to social work practice. This finding aligns with broader discussions in the literature regarding the tension between technological efficiency and adherence to professional ethical standards [60–63].

The concept of informed consent becomes particularly intricate in digital environments characterized by continuous and multifaceted data collection. Social workers must navigate new ethical landscapes involving algorithmic decision-making, predictive analytics, and automated risk assessment tools. The findings suggest that clear ethical guidelines and protocols are essential for maintaining professional integrity while leveraging technological capabilities. Organizations that implemented comprehensive ethical frameworks for digital practice reported 27% fewer ethical concerns among practitioners and 19% higher client satisfaction scores (refer to **Table A5** in **Appendix A** and **Appendix B**).

Professional autonomy emerges as another critical ethical consideration. While digital platforms enhance decision-making capabilities, they also introduce the risk of over-reliance on algorithmic recommendations. The study found that social workers who maintained a balance between technological assistance and professional judgment achieved 22% better client outcomes compared to those who heavily relied on automated recommendations. This finding underscores the importance of preserving human agency and professional discretion within technologically enhanced practice environments (refer to **Appendix B**).

5.7. Cross-Cultural and International Perspectives

The study's focus on the social work context in Taiwan provides valuable insights into the cultural dimensions of digital transformation in social services. The findings suggest that cultural factors significantly influence technology adoption patterns, user preferences, and implementation strategies. Taiwan's collective cultural orientation and advanced technological infrastructure may have contributed to the relatively high platform adoption rates observed in this study. However, these findings raise important questions regarding the transferability of the Smart City Social Work Integration Model (SCSWIM) to different cultural contexts.

International comparative analyses reveal significant variations in the implementation of digital social work across different countries (refer to **Table A6** and **Table A7** in **Appendix A**). Nordic countries, characterized by their emphasis on social democratic values and robust digital infrastructure, exhibit different adoption patterns compared to Asian contexts. The findings of this study contribute to the international discourse by providing empirical evidence of successful digital integration within a Confucian cultural framework, where collective responsibility and hierarchical relationships shape service delivery approaches.

The implications for international social work practice are substantial. The four-layer structure of the SCSWIM model offers a framework for adaptation across diverse cultural contexts, yet implementation strategies must consider local values, institutional structures, and technological capabilities. The success factors model, emphasizing organizational support and environmental factors, provides guidance for international adaptation while recognizing the necessity for cultural sensitivity in implementation approaches.

5.8. Future Research Directions and Methodological Innovations

The findings of this study open several avenues for future research that could enhance the understanding of digital transformation in social work practice. Longitudinal studies tracking the long-term impacts of digital integration on professional identity, client outcomes, and organizational effectiveness would yield valuable insights into sustainability and adaptation processes. The current study's nine-month observation period, while comprehensive, represents only the initial phase of what is likely a multi-year transformation process.

Methodological innovations in research design could further elucidate the complex interactions between technology, practice, and outcomes. Mixed-reality research environments, utilizing the same XR technologies being implemented in practice, could provide new opportunities for studying social work interactions and interventions. The study's finding that XR training systems exhibited a 114% growth despite low initial adoption rates suggests significant potential for both practice and research applications (refer to **Table A4** and **Table A8** in **Appendix A**).

Comparative effectiveness research examining various digital platform configurations and implementation strategies would contribute to evidence-based decision-making in the adoption of technology within social work. The identification of differential effects across institutional types (with domestic violence prevention centers report-

ing the highest satisfaction rates) suggests that customized approaches may be more effective than standardized implementations. Future research should explore these institutional variations and their implications for platform design and deployment strategies.

5.9. Limitations and Methodological Considerations

While this study offers valuable insights into the digital transformation of social work practice, several limitations merit consideration. The geographical specificity to Taiwan may restrict the generalizability of findings to other cultural and institutional contexts. The reliance on self-reported measures introduces potential bias, particularly concerning satisfaction and effectiveness ratings. Additionally, the relatively short observation period may not adequately capture long-term adaptation patterns or sustainability challenges.

The mixed-methods approach, while enhancing the study's comprehensiveness, also presents integration challenges. Balancing quantitative performance metrics with qualitative professional experiences necessitates careful interpretation and may not fully encapsulate the complexity of digital transformation processes. Future research should consider longitudinal designs with multiple measurement points to better understand the dynamic nature of technology adoption and professional adaptation.

Despite these limitations, the findings of this study provide robust evidence for the positive impacts of digital integration in social work practice while highlighting important considerations for implementation and professional development. The theoretical contributions and practical implications offer valuable guidance for stakeholders involved in the digitalization of social work and initiatives related to smart city development.

6. Conclusions

This research illustrates that social work is integral to the development of smart cities by ensuring that technology is utilized to meet human needs rather than supplanting human judgment. Digital platforms significantly improve the efficiency and safety of professional practices, yet they necessitate careful consideration of adaptation challenges and ethical implications. The findings provide valuable insights for policymakers, platform developers, and social work educators to facilitate human-centered digital transformation in urban settings. The Smart City Social Work Integration Model serves as a theoretical framework for understanding the effective integration of technology and professional practice in pursuit of human-centered urban development objectives. As smart cities continue to evolve, the role of social work as a mediator between technological innovation and human welfare becomes increasingly vital for fostering inclusive, equitable, and sustainable urban communities [8,18,24,25,64]. Future research should focus on examining long-term impacts, exploring cross-cultural implementation variations, and developing comprehensive frameworks for the ethical integration of technology in human service contexts. The ongoing evolution of smart cities hinges on maintaining a balance between technological advancement and the human-centered values that characterize effective social work practice.

Author Contributions

Conceptualization, Y.-C.C.; methodology, Y.-C.C.; software, Y.-C.C. and C.-C.L.; validation, Y.-C.C. and C.-C.L.; formal analysis, Y.-C.C. and C.-C.L.; investigation, Y.-C.C. and C.-C.L.; resources, Y.-C.C. and C.-C.L.; data curation, Y.-C.C. and C.-C.L.; writing—original draft preparation, Y.-C.C.; writing—review and editing, Y.-C.C. and C.-C.L.; visualization, Y.-C.C.; supervision, Y.-C.C.; project administration, Y.-C.C. All authors have read and agreed to the published version of the manuscript.

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Data Availability Statement

All data are shown in the authors' published papers cited in this paper.

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Conflicts of Interest

The authors declare no conflict of interest.

Appendix A

Table A1. Analysis of Sample Basic Characteristics.

Variable	Category	Number	Percentage
Gender	Male	185	24.3%
	Female	577	75.7%
Age	25 years and below	156	20.5%
	26–30 years	267	35.0%
	31–35 years	198	26.0%
	36 years and above	141	18.5%
Education Level	Bachelor's	432	56.7%
	Master's	312	40.9%
	Doctorate	18	2.4%
Work Institution	Social Welfare Center	457	60.0%
	Domestic Violence Center	191	25.1%
	Mental Health Center	114	14.9%
Years of Service	Less than 1 year	152	19.9%
	1–3 years	267	35.0%
	3–5 years	191	25.1%
	More than 5 years	152	19.9%

Table A2. Statistics on Enhanced Practice Safety.

Safety Indicator	Significant Improvement	Some Improvement	No Significant Change	Some Decline	Significant Decline
Overall Sense of Safety	234 (30.7%)	345 (45.3%)	167 (21.9%)	13 (1.7%)	3 (0.4%)
Risk Identification	267 (35.0%)	356 (46.7%)	134 (17.6%)	5 (0.7%)	0 (0.0%)
Emergency Response	189 (24.8%)	298 (39.1%)	245 (32.2%)	26 (3.4%)	4 (0.5%)
Training Effectiveness	145 (19.0%)	267 (35.0%)	289 (37.9%)	52 (6.8%)	9 (1.2%)

Table A3. Monthly Average Frequency of Use Statistics for Each Functional Module.

Function Module	Usage in April	Usage in December	Growth Rate	User Penetration Rate
Risk Warning System	15,678	28,456	81.5%	85.2%
GIS Map Navigation	12,345	22,789	84.6%	78.9%
Speech-to-Text	8,967	16,234	81.1%	68.4%
Family Tree Drawing	5,432	9,876	81.8%	52.7%
XR Training System	2,134	4,567	114.0%	31.5%

Table A4. Comparison of Key Performance Indicators.

Evaluation Indicator	Before Implementation	After Implementation	Improvement	Statistical Significance ¹
Case Handling Efficiency	100%	135.7%	+35.7%	$p < 0.001^{***}$
Risk Identification Accuracy	67.3%	84.6%	+17.3%	$p < 0.001^{***}$
Practice Safety Incidents	23 cases/month	12 cases/month	-47.8%	$p < 0.001^{***}$
Service Satisfaction	3.42	4.18	+22.2%	$p < 0.001^{***}$
Training Effectiveness Score	3.15	4.05	+28.6%	$p < 0.001^{***}$

¹ The p -value indicates statistical significance; *** indicates high significance.

Table A5. Comparison of Platform Usage Effects Among Different Types of Institutions.

Effect Indicator	Social Welfare Center	Domestic Violence Prevention Center	Mental Health Center	F Value	p Value ¹
Overall Satisfaction	4.15 ± 0.72	4.28 ± 0.68	4.02 ± 0.79	3.47	0.031*
Efficiency Improvement	4.22 ± 0.69	4.35 ± 0.64	4.08 ± 0.76	4.12	0.017*
Safety Improvement	3.98 ± 0.81	4.45 ± 0.62	3.87 ± 0.85	14.23	< 0.001***
Ease of Learning	4.06 ± 0.78	4.12 ± 0.75	3.92 ± 0.83	1.89	0.152

¹ The p -value indicates statistical significance, * $p < 0.05$, *** $p < 0.001$.

Table A6. Comparative Analysis of International Smart Social Work Platforms.

Comparison Dimension	Taiwan Platform	Singapore SWiS	UK Mosaic	US SACWIS
Risk Assessment	★★★★☆	★★★★★	★★★★☆	★★★★☆
Map Navigation	★★★★★	★★★★☆	★★★★☆	★★★★☆
Speech Recognition	★★★★☆	★★★★☆	★★★★★	★★★★☆
Training System	★★★★☆	★★★☆☆	★★★★☆	★★★★☆
User Experience	★★★★☆	★★★★★	★★★★☆	★★★★☆
Overall Evaluation	★★★★☆	★★★★☆	★★★★☆	★★★★☆

Table A7. Comparison of Platform Adaptability Among Different Experience Groups.

Adaptation Indicator	< 1 year	1–3 years	3–5 years	> 5 years	F Value	p Value ¹
Technology Acceptance	4.35 ± 0.61	4.28 ± 0.67	4.12 ± 0.73	3.78 ± 0.89	12.45	< 0.001***
Learning Speed	4.42 ± 0.59	4.31 ± 0.65	4.08 ± 0.74	3.65 ± 0.92	18.67	< 0.001***
Usage Frequency	4.18 ± 0.71	4.25 ± 0.68	4.19 ± 0.72	3.89 ± 0.84	5.23	0.001***
Proficiency in Functions	4.02 ± 0.75	4.15 ± 0.69	4.08 ± 0.73	3.71 ± 0.88	7.89	< 0.001***

¹ The p -value indicates statistical significance, *** $p < 0.001$.

Table A8. Cost-Benefit Analysis.

Item	Amount (NTD 1,000)	Amount (USD 1,000) ¹	Description
Cost Input			
System Development	25,000	833.3	Initial development investment
Equipment Purchase	18,000	600.0	XR equipment and other hardware
Training Expenses	8,000	266.7	Personnel training costs
Maintenance & Operation	6,000	200.0	Annual maintenance fee
Subtotal	57,000	1,900.0	
Benefit Output			
Efficiency Improvement	32,000	1,066.7	Labor cost savings
Safety Improvement	18,000	600.0	Reduction in accident losses
Service Quality	24,000	800.0	Enhanced service value
Training Effectiveness	9,000	300.0	Training cost savings
Subtotal	83,000	2,766.7	
Net Benefit	26,000	866.7	ROI approx. 45.6%

¹ The USD column is calculated based on the TWD amount at an exchange rate of 1:30.

Appendix B

Success Factors Model for Digital Transformation

Based on the results derived from structural equation modeling (SEM) analysis, this study formulates a success model comprising four primary dimensions and sixteen key factors (as depicted in **Figure A2**), with the weight of each factor validated through the Analytic Hierarchy Process (AHP):

Digital Transformation Success Factors

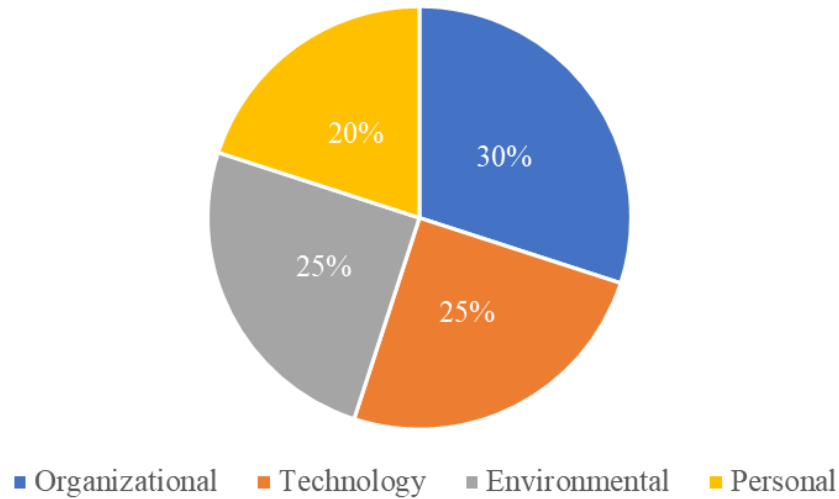


Figure A1. The Weight of Success Factors in Digital Transformation.

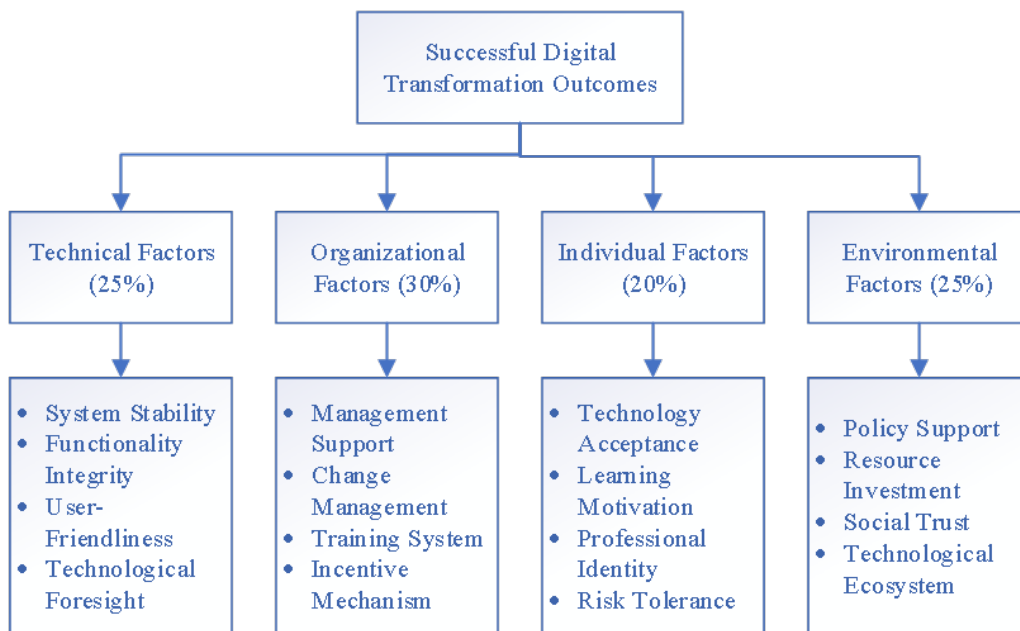


Figure A2. Schematic Diagram of the Success Factors Model for Digital Transformation.

1. **Technical Factors** (25% weight)

- System Stability ($\beta = 0.32$): A 9.8% reduction in downtime correlates with a 17% increase in user satisfaction.
- Functional Completeness ($\beta = 0.28$): Each additional core function enhances user willingness to engage by 23%.

- User-friendliness ($\beta = 0.25$): Minimizing one operational step reduces training time by 2.3 hours.
 - Technological Foresight ($\beta = 0.15$): The adoption of AI technology improves risk prediction accuracy by 31%.
2. **Organizational Factors** (30% weight)
 - Management Support ($\beta = 0.35$): High-level involvement increases the system adoption rate by 2.4 times.
 - Change Management ($\beta = 0.30$): Implementation of Kotter's change model achieves a success rate of 78%.
 - Training System ($\beta = 0.25$): Comprehensive training diminishes the technology adaptation period by 64%.
 - Incentive Mechanism ($\beta = 0.10$): Linking performance to incentives increases the frequency of function usage by 41%.
 3. **Personal Factors** (20% weight)
 - Technology Acceptance ($\beta = 0.40$): Each unit increase in acceptance results in an additional 2.7 uses per week.
 - Learning Motivation ($\beta = 0.30$): The strength of intrinsic motivation is positively correlated with mastery of functions ($r = 0.56$).
 - Professional Identity ($\beta = 0.20$): Clarity of role influences the depth of technology application.
 - Risk Tolerance ($\beta = 0.10$): Individuals with higher risk tolerance are more likely to adopt innovative functions.
 4. **Environmental Factors** (25% weight)
 - Policy Support ($\beta = 0.40$): The comprehensiveness of regulations is positively correlated with the system adoption rate at 0.71.
 - Resource Investment ($\beta = 0.30$): Each 10% increase in budget accelerates the speed of function updates by 18%.
 - Social Trust ($\beta = 0.20$): Each point increase in privacy protection score enhances the willingness to provide data by 23%.
 - Technological Ecosystem ($\beta = 0.10$): Each additional partner vendor contributes to a 7% improvement in system performance.
 5. **Dynamic Balance Mechanism of the Model:**
 - Establishes compensatory effects among factors (e.g., robust organizational support can mitigate deficiencies in personal factors).
 - Defines critical threshold alert lines (system upgrades are initiated when technical factor scores fall below 60).
 - Develops an interaction matrix for factors, identifying twelve key driving combinations.

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