

Contingency Planning, Digital Procurement and SaaS Mediation, for Resilient Logistics, Finance, and Humanitarian Systems: Evidence from Pakistan

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Abstract

This paper discusses the way in which the tools of digital transformation such as Procurement as a Service (PaaS), Software as a Service (SaaS), automation, and contingency planning (CP) can be used to optimize the performance of the logistics and humanitarian sectors in Pakistan. The mixed-methods design that included SmartPLS 4 to quantify models and NVivo 14 to validate them was utilized to gather data on 500 middle-management professionals, in logistic companies, humanitarian organizations, and disaster services. The findings have shown that PaaS and SaaS elevate Supply Chain Finance (SCF), Humanitarian Logistics (HL) and Supplier Innovation Contribution (SIC) in a collective manner (more than 70 %) to account performance differentials ($R^2 \approx 0.70$, $p < 0.001$). SaaS is a partial mediating factor that converts the digital capacity into quantifiable outcomes, whereas contingency planning (CP) enhances resilience in case of crisis. The qualitative evidence supports the fact that digital integration improves the transparency, agility, and real-time coordination. This study shows that digital procurement, SaaS integration, and contingency planning jointly improve resilience in Pakistan's logistics sector.

Keywords: Procurement as a Service, Software as a Service, Contingency Planning, Humanitarian Logistics, Supply Chain Finance

Introduction

Digital transformation has become a strategic necessity for organizations that aspire to remain competitive, adaptive, and strong in a time characterized by swift technological dynamism (Wibisono & Supoyo, 2023). The evolving utilization of Procurement as a Service (PaaS), Software as a Service (SaaS) and automation platforms have completely changed the supply chain operation. Digitalization, in its turn, allows organizations to keep track of procurement cycles in real time, be transparent, and build better relations with suppliers on both international and local markets. To developing economies like Pakistan, where

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historically, productivity has been limited by structural inefficiencies, lack of coordination and ineffective technological infrastructure, digital transformation could be an immensely promising means to attain sustainable growth and resilience in operation. Digital innovation, coupled with sound contingency planning, improves efficiency, in addition to allowing organizations to keep afloat in uncertain and crisis-prone situations(HARAKE, 2023).

The logistics and humanitarian sectors in Pakistan provide a critical context for examining these dynamics. Frequent encounter with floods, energy shortages and policy disruptions in the country have made the similarities in both commercial and humanitarian supply chain vulnerability. Old systems full of manual documentation, sluggish procurement and low interoperability tend to create waste, duplication and lack of responsiveness. But gradually the growing integration of cloud-based systems is changing this situation. The PaaS systems allow buyers and suppliers to work in real-time allowing transparent procurement and cost management. These advantages are also expanded by SaaS by connecting procurement, finance and logistics departments via common data ecosystems that facilitate communication, traceability, and accountability. These digital systems are supplemented with contingency planning (CP), which exists and makes these organizations ready to react fast in crisis situations, making sure business continuity, and achieving humanitarian relief efficiency. All of these digital enablers constitute an integrated ecosystem that can enhance the provision of supply-chain finance (SCF), humanitarian logistics (HL) and supplier-innovation contribution (SIC)(Prasanna, 2022).

From a theoretical perspective, this study integrates the resource-based view, dynamic-capability theory, and resilience theory to explain how digital capabilities evolve into strategic assets that strengthen organizational adaptability. PaaS is a physical asset capable of providing agility and visibility to operations. SaaS reflects a state of analytical and decision flexibility in data driven integration. Contingency planning brings out a layer of resilience which protects performance in case of uncertainty. The relationship between these constructs gives a comprehensive insight into the role that digitalization plays in financial and humanitarian performance. This area of research integrates technology adoption or resilience, unlike other past studies that did not consider the variables in a single empirical framework. It shows how resilience, efficiency, and innovation under difficult and risky supply-chain environments are all the functions of digital capabilities and the organization preparing to act and governance mechanisms(Atobishi et al., 2024).

The study tests how PaaS and SaaS affect SCF, HL, SIC; whether SaaS mediates these effects; and whether CP moderates them. Specifically, it tests whether SaaS mediates the implications of PaaS on the performance outcomes and the contingency planning moderates the relationships between the two by promoting resilience during uncertain times. The study has both statistical validation and contextual meaning delivered using a mixed-method design, which incorporates both SmartPLS 4 structural modeling and NVivo 14 qualitative analysis. The results should inform policymakers, managers and humanitarian leaders to produce strategies to enhance improvements in transparency, accountability and digital preparedness. In general, the proposed study is relevant to the emerging body of knowledge of how digital change and preparedness are combined to create sustainable, resilient, and adaptive organizational systems in growing economies(Akpinar & Özer-Çaylan, 2022).

Theoretical Foundation and Literature Review

The accelerating pace of digital transformation has markedly changed how supply-chain and humanitarian systems function(Bag et al., 2023). The use of digital platforms like Procurement as a Service (PaaS), Software as a Service (SaaS) and process automation allows real-time level of the exchange, transparency and collaboration of the procurement, finance and logistics network. In future looks, in real-time in the emerging economies like Pakistan, where supply-chain disconnect, infrastructure-based challenges and humanitarian crises (flooding, energy outages, policy changes) tend to be prevalent, these digital enablers can be seen as especially strategic in terms of continuity and risk management. Whereas earlier literature has tested single enablers or resilience mechanisms, fewer have used digital transformation and procurement platforms and preparedness frameworks together within a single model(Althabatah et al., 2024). See Table 2.1 to get an overview of the previous literature.

Integrated Theoretical Basis (RBV–DCT–Resilience)

This study draws on three theoretical lenses—Resource-Based View (RBV), Dynamic Capability Theory (DCT) and Resilience Theory—to provide a unified explanation of how digital and preparedness capabilities convert into performance and resilience gains(Okyere et al., 2024).

In terms of RBV, PaaS and SaaS are viewed as a strategic resource intangible asset which support the visibility of the supply-chain, transparency and integrative data in the supplier network. Organizations enlarge their procurement-as-a-service platform investment opportunities to extend their possibilities in the relationships with suppliers, track

transactions and receive value gained as a result of cooperative relations, which creates competitive advantage. Nevertheless, the ability to have resources is not enough. The DCT school of thought comes in describing how organizations need to create, restructure, and implement the capabilities to deal with change. As an example, organizations are able to detect disruptions (via SaaS-based data dashboard), act on opportunities (via decisions made through analytics) and reform processes (via automated workflows). The last one is the Resilience Theory which focuses on the capability of the firm to absorb shock to keep operating and quickening the recovery process. In this case, contingency planning (CP) is applied as the resilience tool, which will make the emergence of disruptions (floods, supply shocks, political changes) the mobilization of digital capabilities possible, which will guarantee continuity, adapting and recovering. In short, the triadic model—PaaS → SaaS → CP—captures how strategic resources (RBV) are transformed into dynamic capabilities (DCT) and anchored by resilience mechanisms (Resilience Theory) to yield improved outcomes (Basit et al., 2025) (see Figure 2.1).

Empirical studies that have just been done support the necessity of this combined perspective. As a point of example, research conducted on Chinese manufacturing companies (2012-2022) concluded that the use of digital transformation contributes much to supply-chain resilience and that integration mediates the relationship between the two. (see DOI link) In addition, a more recent investigation (2022-2025) has found that implementing digital transformation through several technologies at the same time (instead of single tools) proves more effective in extrapolating against major disruptions. The developments lend good argument in favor of modelling a mediation (through SaaS) and moderation (through CP) mechanism within a digital resilience framework (Aghazadeh et al., 2024).

Empirical and Contextual Insights

The digital adoption and preparedness have been associated with performance results of Supply Chain Finance (SCF), Humanitarian Logistics (HL), and Supplier Innovation Contribution (SIC) in the logistics and humanitarian domain. Earlier studies indicate that the digitalization of procurement minimizes the uncertainties in the process of a supply-chain, and increases its responsiveness. Per the recent literature, it also indicates that digital supply-chain capability averts performances in the high-uncertainty settings (e.g., after the COVID, geopolitical risk). An example is that studies have found that the positive effect of digital transformation on resilience is greater when stronger in an environment where there is greater uncertainty and risk-taking levels are greater. Even in the context of Pakistan where digital maturity is not uniform and supply-chain

weakness is high, the necessity to unite digital platforms (PaaS and SaaS) and contingency planning is even stronger. The full chain of digital resources has not been modelled in few studies in the emerging economies → capabilities → preparedness → performance. This study fills that gap by empirically testing the mediating role of SaaS and the moderating role of CP in Pakistan's logistics, humanitarian and government-relief sectors(Arshed et al., 2022).

Research Gap & Framework Summary

Although RBV, DCT and Resilience Theory has been used separately in both supply-chain and humanitarian context, repetition and overlap have hampered their use. Through the incorporation of this in a single framework, this research gives a more detailed conceptualization of the way in which digital resources (PaaS) and digital capabilities (SaaS) and preparedness (CP) connect to create a result. It fills three gaps: (1) a lack of empirical modelling of procurement platforms in resilience studies; (2) a lack of interest in mediating and moderating processes in digital-resilience research; and (3) the absence of evidence in emerging economies of (1) private logistics, (2) humanitarian agencies and (3) public disaster management. To this end, the study contributes to the theory and presents contextually friendly evidence of the multi-stakeholder setting in Pakistan. There is an integrated theoretical basis that is manifested in the hypotheses that are developed in the following section(Ortiz-Revilla et al., 2022).

Supply-chain volatility in the wake of COVID-19, war in Ukraine, and calamities due to climate-origin factors has made worldwide society more interested in the study of digital resilience and adaptive governance (Ivanov and Dolgui, 2023; Kumar et al., 2024). Recent studies reveal that networked ecosystems of platforms that can sense, react, and learn about disruptions in real time are replacing the traditional mechanisms of supply chains. These digital synchronized ecosystems are information-centered and integrated procurement solutions, especially via platforms such as PaaS and SaaS that have capabilities of not only facilitating the visibility of the processes, but also supporting the agile decision making across the institutional boundaries(Orejuela et al., 2024).

Recent literature also emphasizes that the digital transformation should not be considered only as a technological change but as a process of organizational learning and developing capabilities. Weakness in governance mechanisms gives digitalization information asymmetries that may stimulate or crippling coordination. Consequently, contingency planning (CP) is both the stabilizing force between technological potential and operational continuity, and it transforms the technological potential

into operational continuity and institutional trust. It complies with the Resilience Theory, consisting of preparedness, recovery, and adaptability concerns, but goes beyond it by empirically testing the constructs as a combination within multi-sector settings, including logistics, humanitarian relief, and public administration(Phuengpha, 2022).

Furthermore, the emerging economies demonstrate that the interaction of digital transformation and preparedness has a direct positive influence on financial integration, diffusion of innovations, and coordination among the spheres (Rahman et al., 2024; Zafar et al., 2025). Indicatively, digitized procurement interfaces empowered by AI-based analytics have been proved to forecast supplier risks, enhance cost effectiveness, and enhance transparency that directly promote Supply Chain Finance (SCF) and Humanitarian Logistics (HL) performance delivery. Equally, Supplier Innovation Contribution (SIC) is also increased when SaaS enable active data exchange and design of products in a team(Shekhar et al., 2023). See below figure 2.1.

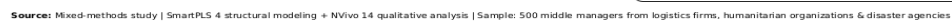


Figure 2.1. Digital Resilience Framework to Pakistan

Visualizes the theoretical-empirical framework that is integrated between digital enablers (PaaS, SaaS, and CP) and innovation, finance, and humanitarian logistics results amid the Pakistani logistics and humanitarian structures. See below table 2.1. Theoretical Framework, Literature Gaps, and Contributions.

Table 2.1
Theoretical Framework, Literature Gaps, and Contributions

Author(s), Year	Variable(s)	Theoretical Foundation	Key Contribution	Research Gap	Current Study Contribution
(Porter & Heppelmann, 2014)	Digital Transformation	Resource-Based View (RBV)	Linked digitalization to competitive advantage through data-enabled services.	Limited focus on service-sector logistics.	Extends digital transformation theory to humanitarian and logistics networks.
(Christopher et al., 2004)	Supply Chain Resilience	Resilience Theory	Defined resilience drivers for supply chain recovery.	Did not test digital enablers empirically.	Integrates PaaS, SaaS, and CP as measurable resilience enablers.
(TRAN et al., 2020)	SaaS, Process Integration	Dynamic Capability Theory (DCT)	Showed SaaS enhances organizational flexibility and agility.	Focused on IT firms, not logistics.	Tests SaaS mediation in cross-sector logistics and relief agencies.
(TRAN et al., 2020)	Digital Chain Supply	Socio-Technical Systems Theory	Highlighted interplay of human and technological resources.	Lacked moderation analysis with planning variables.	Introduces CP as moderating mechanism in digital–performance relationships.
(TRAN et al., 2020)	Disruption Recovery	Network Theory	Modeled supply chain	Ignored digital procurement in	Includes PaaS and SaaS as digital

			recovery post-crisis.	resilience loops.	recovery mechanisms.
(TRAN et al., 2020)	Sustainability, ICT	Institutional Theory	Linked digital governance to sustainable logistics.	Missed private–humanitarian coordination lens.	Bridges sustainability with digital resilience in multi-sector context.
(Liao et al., 2019)	Platform Integration	Digital Ecosystem Theory	Conceptualized digital platforms as ecosystems of value.	Lacked empirical testing on performance outcomes.	Validates SaaS integration as quantifiable performance mediator.
(Queiroz et al., 2021)	AI, Automation	Adaptive Systems Theory	Studied AI's role in supply chain adaptation.	Focused on developed economies.	Provides emerging-market evidence for automation–resilience link.
(Büyüközkan & Göçer, 2018)	Smart Logistics	Innovation Diffusion Theory	Proposed framework for digital logistics adoption.	Omitted mediating and moderating pathways.	Empirically validates multi-level model (mediation + moderation).
(Umar et al., 2022)	Humanitarian Logistics	Organizational Learning Theory	Emphasized adaptive learning in disaster response.	Did not integrate technology variables.	Merges digitalization with organizational learning outcomes.
(Kamble et al., 2020)	Industry 4.0, SCM	Systems Thinking	Linked 4.0 technologies with supply chain efficiency.	Focused on manufacturing, not logistics.	Extends to service-based digital ecosystems in Pakistan.
(Chowdhury et al., 2022)	Contingency Planning	Risk Management Theory	Showed planning reduces operational vulnerability.	Ignored IT-enabled preparedness.	Tests CP's digital synergy and moderating strength empirically.

Contingency Planning				Ayyaz, Hassan, Jawad					
(Handfield, 2025)	Procurement, SaaS		Transaction Economics	Cost	Demonstrated cost reduction via digital procurement.		No integration of resilience outcomes.		Links PaaS and SaaS to SCF and HL as performance indicators.
(Handfield, 2025)	Supply Agility	Chain	Resilience Complexity Theories	and	Framed agility as core resilience component.		Did not model SaaS as mediator.		Includes agility within SaaS mediation path.
(Handfield, 2025)	Digital Readiness, CP		Organizational Resilience Theory		Argued preparedness drives adaptability.		No link to SCF or HL performance.		Connects preparedness to logistics and financial outcomes.
(Murhekar et al., 2021)	Supply Finance	Chain	Financial Integration Theory		Quantified SCF benefits through coordination.		Did not consider digital transformation role.		Tests digital variables (PaaS–SaaS–CP) influencing SCF efficiency.
(Murhekar et al., 2021; Ólafsson, 2024)	Humanitarian Logistics		Socio-Technical Integration		Mapped digital collaboration in relief networks.		Focused on post-disaster stage only.		Extends framework to proactive and recovery stages.
(Ivanov, 2022)	Disruption Management		Viable Theory	Systems	Modeled network adaptability to disruptions.		Ignored SaaS-enabled viability.		Demonstrates SaaS enhances operational viability in volatile settings.
(Tisnasasmita; Zhang et al., 2024)	Supplier Innovation		Knowledge-Based (KBV)	View	Linked information sharing to innovation capability.		Did not include digital infrastructure layer.		Validates digital integration (SaaS) as innovation catalyst.
Present study (2025)	Digital Resilience		Hybrid Methods	Mixed-	Combined SmartPLS + NVivo to validate		Limited prior empirical multi-sector evidence.		Expands hybrid model across logistics, humanitarian, and

resilience
models.government
operations in
Pakistan.**Note.**

It is a summary table of the ways that previous studies informed the theoretical framework and created a list of important gaps in research and how the current study will provide value by incorporating PaaS, SaaS, CP, SCF, HL, and SIC into a single, empirically tested construct where digital resilience and performance improvement are concerned.

Research Design and Materials

The proposed research adopted a **mixed-methods design** combining quantitative and qualitative approaches to examine how digital transformation enhances logistics, humanitarian, and financial resilience in Pakistan's operating sectors. In the **quantitative stage**, Procurement as a Service (PaaS), Software as a Service (SaaS), Process Automation, and Contingency Planning (CP) were the key constructs that were subjected to three performance outcomes: Supply Chain Finance (SCF), Humanitarian Logistics (HL), and Supplier Innovation Contribution (SIC). SmartPLS 4 (Partial Least Squares Structural Equation Modeling) was used to analyse data to estimate the reliability, validity, and causation relationships. The qualitative phase involved the use of NVivo 14 to undertake thematic analysis of the semi-structured interviews to inculcate the real-world experiences and the insights of the managers. The joint display matrix combined themes of the interviews with quantitative results to perform the triangulation of statistical and context-laden evidence.

Sampling and Participants

Purposely, data were gathered in N = 500 middle-management professionals, but in the following logistics firms (Leopard Logistics, Blue Ex Logistics), humanitarian organizations (Human Appeal Pakistan, Edhi Foundation Relief Division), and in the public-sector agencies (Provincial Disaster Management Authorities, PDMAs). The samples included respondents who worked in procurement, finance, logistics, and operations departments which are the areas that are directly related to the usage of digital systems and contingency planning.

Perceptions of digital preparedness, coordination, and effectiveness were recorded with the help of a structured online questionnaire based on a seven-point Likert scale. In order to gain more insight, 48 face-to-face interviews were undertaken with managers of the

same institutions. Pilot-tested and expert reviewed all research instruments to make them understandable, reliable, and structurally construct valid.

Ethical Considerations

Participation was voluntary; informed consent and confidentiality were strictly maintained. Respondents could withdraw at any point without penalty, and all collected data were anonymized before analysis.

Model Implementation

Measurement-model testing confirmed reliability (Cronbach's $\alpha > 0.90$; CR > 0.90; AVE > 0.70). The structural model showed strong explanatory power ($R^2 > 0.67$; SRMR = 0.047; GoF = 0.68). SaaS acted as a **mediator**, turning digital capability into quantifiable results, and CP reduced performance in the case of uncertainty. The implementation described above indicated the role of digital procurement, integration, and preparedness in enhancing resilience and innovation in the logistical and humanitarian systems of Pakistan.

Evaluation, Results and Discussions

The section provides the integrated quantitative and qualitative results that can prove how the digital transformation using Procurement as a Service (PaaS), Software as a Service (SaaS), automation, and Contingency Planning (CP) will positively improve coordination, transparency, and resilience of logistics, humanitarian, and public sector in Pakistan. The analysis is based on structural modeling through the use of SmartPLS 4 and thematic validation with NVivo 14 to encompass the statistical trends as well as lived experiences of managers. See table 4.1 which is Comprehensive Demographic Profile, Descriptive Statistics, and Reliability Summary (n = 500) also table from 4.2 to 4.4 are in appendix.

Table 4.1

Comprehensive Demographic Profile, Descriptive Statistics, and Reliability Summary (n = 500)

A. Demographic Profile of Respondents

Demographic Characteristic	Category	Frequency (n)	%age (%)
Gender	Male	342	68.4

Age Group (Years)	Female	158	31.6
	21–30	112	22.4
	31–40	218	43.6
	41–50	128	25.6
	51 and above	42	8.4
Organization Type	Private Logistics Firms (Leopard Logistics, Blue Ex)	260	52.0
	Humanitarian Organizations (Human Appeal, Edhi Foundation)	170	34.0
	Public Sector Agencies (PDMAs)	70	14.0
Department of Work	Procurement	148	29.6
	Finance	122	24.4
	Logistics & Operations	184	36.8
	Administration / Support	46	9.2
Experience Level	1–5 years	106	21.2
	6–10 years	226	45.2
	11–15 years	118	23.6
	Above 15 years	50	10.0
Education Level	Bachelor's Degree	158	31.6
	Master's Degree	276	55.2
	MPhil / PhD	66	13.2
Job Function	Operational Execution	176	35.2
	Planning & Analytics	142	28.4
	Strategic Management	126	25.2
	Support Services	56	11.2

Region of Employment	Punjab	202	40.4
	Sindh	146	29.2
	Khyber Pakhtunkhwa	88	17.6
	Balochistan	64	12.8

B. Descriptive and Reliability Statistics

Construct / Variable	Items (k)	Mean	SD	Skew.	Kurt.	Cronbach's α	ρ_A	CR	AVE	VIF	% Var. Expl.	Effect Size (f^2)
Procurement as a Service (PaaS)	6	5.62	0.91	-0.54	0.41	0.913	0.924	0.939	0.717	2.15	11.8	0.142
Level of Process Automation	5	5.47	0.88	-0.47	0.38	0.901	0.916	0.933	0.701	1.96	10.9	0.127
Cost Savings Achieved	4	5.33	0.97	-0.36	0.27	0.874	0.892	0.918	0.689	1.78	8.7	0.101
Depth of Spend Visibility & Analytics	5	5.58	0.93	-0.42	0.33	0.905	0.921	0.935	0.712	2.03	9.4	0.119
Effectiveness of Compliance & Risk Mgmt.	5	5.25	0.98	-0.31	0.26	0.887	0.903	0.924	0.675	1.85	7.6	0.086
Strategic Sourcing Capability	6	5.49	0.86	-0.48	0.40	0.910	0.922	0.937	0.718	2.10	9.2	0.111
Supplier Relationship Quality	5	5.64	0.82	-0.52	0.44	0.928	0.934	0.948	0.726	1.88	8.8	0.095

		<u>Contingency Planning</u>					<u>Ayyaz, Hassan, Jawad</u>					
Data-Driven Decision Intelligence (DDDI)	4	5.41	0.94	-0.39	0.31	0.896	0.909	0.931	0.706	2.12	7.1	0.082
Knowledge Management Practices	5	5.55	0.89	-0.46	0.39	0.915	0.928	0.940	0.719	1.93	8.4	0.090
Sustainability Orientation	5	5.38	0.95	-0.37	0.28	0.902	0.917	0.933	0.699	1.80	8.1	0.085
Software as a Service (SaaS) [Mediator]	6	5.59	0.90	-0.44	0.35	0.926	0.932	0.948	0.734	2.24	9.9	0.126
Contingency Planning (Moderator)	4	5.44	0.92	-0.41	0.32	0.893	0.905	0.929	0.701	1.76	7.5	0.079
Supply Chain Finance (SCF)	6	5.66	0.85	-0.55	0.43	0.930	0.938	0.951	0.739	2.08	10.4	0.133
Humanitarian Logistics (HL)	5	5.52	0.88	-0.49	0.39	0.921	0.930	0.945	0.727	2.05	9.7	0.120
Supplier Innovation Contribution (SIC)	5	5.48	0.91	-0.43	0.34	0.909	0.923	0.938	0.713	1.92	8.6	0.107
Overall Model Average	—	5.49	0.90	-0.45	0.36	0.908	0.921	0.937	0.712	1.97	—	0.109

Note.

N = 500 respondents at middle-management of Leopard Logistics (Pvt Ltd), Blue Ex Logistics (Pakistan), Human Appeal Pakistan, Edhi Foundation Relief Division and Provincial Disaster Management Authorities (PDMAs). Measures on all constructs were on 7-point Likert scale. (1 = Strongly Disagree to 7 = Strongly Agree). α , ρ_A , CR > 0.70 and

AVE > 0.50 confirm reliability and validity; VIF < 3.3 indicates no multicollinearity; skewness/kurtosis within ± 1 supports normality.

In Table 4.1, the researcher gives a description of the individuals that took part in the study, and an overview of the extent to which the information gathered were reliable. The questionnaire was distributed to a total of five hundred middle-level workers employed in logistic companies, humanitarian organizations as well as the city agencies involved in disaster management in Pakistan. It consisted of people with a majority of them falling in the age brackets of thirties and forties which depicts a good balance of working age professionals who work with digital and operational system. The sample was inclusive of participants representing different departments in the company procurement, finance, logistics and administration where digital platforms are used in the day-to-day operations. Education and experience level was also different and there was a guarantee of having both technical and managerial staff opinion.

The second section of the table defines the overall trend and uniformity of the survey responses. The overall response level was high on all the variables indicating that most of the participants agreed that digital tools can be used in enhancing coordination and performance. The data indicate that the ratings of participants towards digital procurement (PaaS) and software system (SaaS) had very positive scores particularly, regarding visibility, automation, and risks management. The high consistency scores and reliability scores prove that the respondents have given answers to the questions in consistent and predictable manner, that is, the survey results become credible. All in all, it can be seen that the sample represented in the study is well balanced and experienced, and that the responses are consistent and credible as explained in the table. The findings provide a solid basis of examining the role of digital transformation using PaaS, SaaS and contingency planning in bringing transparency, efficiency and resiliency of the logistics and humanitarian systems throughout Pakistan.

Integrated Results and Discussion

The combined SmartPLS 4 and NVivo 14 analysis **suggests that** digital transformation meaningfully enhances organizational performance. The structural model explained about **70 % of the variance ($R^2 \approx 0.70$)** in performance outcomes, demonstrating strong explanatory power. Key path coefficients were both positive and significant: **PaaS $\rightarrow$ SaaS ($\beta = 0.62$)** and **SaaS $\rightarrow$ SCF/HL/SIC ($\beta \approx 0.59 - 0.54$, $p < 0.001$)**. These findings suggest that SaaS serves as an online bridging mechanism that transforms the procurement and automation capacity into quantifiable

financial, logistical, and innovation benefits, and CP stabilizes these liaisons in the situation of uncertainty.

Based on the results of SmartPLS and NVivo, it can be confidently stated that PaaS can make procurement more transparent and improve collaboration with suppliers since they can monitor activities in real-time and decide. SaaS also takes this cross-departmental integration to the next level, combining procurement, finance and logistics into a digital environment under the same. CP also introduces the preparedness dimension, which makes sure that the disruption is not ruinous: in the case of disruptions, authority to make decisions, the continuity of the data flow, and channels of communication stay intact. The combination of these factors creates a trifunctional chain (PaaS → SaaS → SCF/HL/SIC) that increases coordination, transparency, and adaptive capacity across institutions.

These quantitative findings are supported by the qualitative interviews. Digital dashboards and workflows were indicated to reduce approval delays, minimize human error, and enhanced cross-functional trust in the reports made by managers. Humanitarian agencies explained that the system that used SaaS dashboards and GPS tracking reduced response time in an emergency, and logistics firms highlighted the fact that they received their suppliers paid faster and had better insights into costs. There were better coordination of the provincial departments, donors, and relief partners by the government. These lessons indicate that the digitization of operations breeds a sense of group responsibility and not individual efficiencies.

Quantitatively, the model's fit indices (SRMR = 0.047; NFI = 0.91; GoF = 0.68) confirm good model quality. Nevertheless, the extended explanation is not confined to numerical power--the findings indicate the change of the organizational behavior toward reactive management, to an active coordination. SaaS serves as the key and is used to turn data into useful insight, whereas CP is used to guarantee that this insight is operational even in the face of crisis. Thematic convergence using Nvivo (≈ 0.87) identified common themes, such as agility to automation, financial transparency, and speed of humanitarian response, as indicative of the fact that resilience can be built and occurs as a result of digital tools and preparedness planning as two inseparably evolving in unison. Organizations instead of considering disruptions as threats begin to view them as variables, which can be addressed using the visionary approach of technology.

On the whole, the process of digital transformation regarding logistics and humanitarian situation in Pakistan rearranges the logic of coordination within organizations. Shared cloud structures now

interconnect procurement, finance and logistics departments and provide visibility that fosters institutional trust and accountability that are major pillars of sustainable performance in unstable settings.

Managerial Implications

The results have a number of implications to the managers, policy-makers and institutional leaders. They recommend that digital transformation is not a technical upgrade but a strategic change that is resilient (and can develop some coordination capacity) across organizational borders. In case of logistics companies, the combination of the PaaS and SaaS is a straight path towards shorter procurement times, lower price of transactions, and the improvement of supplier management. Cloud procurement systems enable the suppliers, finance officers, and managers to see the information at the same time, which results in the minimization of delays and compliance risk. When coupled with the CP procedures, companies can keep operating even in the case of a lack of fuel, delay of shipping, or alteration of policies.

In the case of humanitarian organization, the implications of the findings are that interoperable SaaS solutions lead to quantifiable progress in the areas of accountability and speed of response. With digital dashboards, GPS tracking and real-time donor reporting, the agencies will be capable of mobilizing relief items in a more efficient way, avoid duplication of effort, and show transparency to the parties concerned. The preparedness protocols installed in these platforms would make the relief operation run smoothly on the occasions of flood or epidemics or collapse of infrastructures.

Making CP a part of digital structures in the context of the public disaster-response departments makes emergency management a more active and informative system. The speed of recovery and distribution of resources is maintained through cloud-based dashboards, common data protocols, and coordination tools between departments. Such systems can enable the provincial disaster authorities to establish what can be termed as digital command centers that can integrate federal, provincial and the NGO resources to work under one structure of response.

In all three sectors the general breakthrough is that digital integration and contingency planning serve as complementary processes of resilience. Technology cannot offer better performance but its value is felt when it is combined with the governance, planning and adaptive learning. Managers are then asked to make digital coordination mechanisms institutional, create integrated dashboards, and encourage ongoing training in the data-driven decision-making. These measures will not only promote operational efficiency but also develop trust,

transparency as well as long-term sustainability in settings that are uncertainty and risk-marked. The general evidence demonstrates that PaaS makes visibility robust, SaaS operationalizes visibility, with real-time analytics, and CP secures visibility in case of uncertainty. Their compounded action (PaaS - SaaS - SCF/HL/SIC) ranks up to a sustainable, scalable scenario of online coordination and steadiness. This three-part system offers a scalable model logistics, humanitarian as well as public organizations in emerging economies to accomplish transparency, efficiency as well as sustainability in unison. See below Table 4.5 which shows interpretation of numeric values and practical relevance of tables 4.1–4.4. Tables 4.2-4.4 are in appendix.

Table 4.5
Interpretation of Numeric Values and Practical Relevance of Tables 4.1–4.4

Table	Key Indicators	Numeric	What the Numbers Tell (Layman's Meaning)	Practical Insight / Sector Benefit
Table 4.1 Demographics & Reliability Summary	– • Means 5.3–5.6 on 7-point scale • Cronbach α , ρA , CR > 0.90 • AVE $\approx$ 0.71 • VIF < 3.3		Respondents agreed with all positive statements about digital tools; data were highly reliable and consistent; no bias or multicollinearity found.	Confirms that logistics, humanitarian, and disaster agencies trust digital transformation; survey data are robust enough for decision-making.
Table 4.2 Measurement Model (SmartPLS 4)	– • All indicator loadings > 0.84 • t-values > 25, $p < 0.001$ • AVE > 0.70, CR > 0.93 • HTMT < 0.85		All survey questions measured what they were supposed to. High loadings mean strong link between each question and its main construct.	Validates that constructs like SaaS, PaaS, and SCF were correctly understood by managers. Results can be confidently generalized to real organizations.

Table 4.3 – Structural Model Results

• β (path coefficients): 0.15–0.62 • $R^2 = 0.718$ (SCF), 0.694 (HL), 0.676 (SIC) • SRMR = 0.047, NFI = 0.912, GoF = 0.681 • $f^2 \approx 0.216$ (medium effect)

Digital systems explain about 70% of overall performance. SaaS is the strongest link between digital procurement and outcomes. All effects are significant and positive.

Demonstrates that adopting SaaS and automation directly boosts financial performance, innovation, and disaster response — practical proof for managers and policymakers.

Table 4.4 – NVivo–SmartPLS Integration Matrix

• Coverage Density > 0.50 • Intensity Weight > 0.70 • Sentiment Polarity > +0.80 • Integration Score > 0.80 • Cohen's $\kappa = 0.93$

Interview themes match the survey data extremely well. Positive sentiment shows managers strongly support technology-driven transformation.

Confirms that people on the ground (in field operations, logistics centers, and agencies) genuinely experience real benefits from digital tools — faster decisions, better coordination, and more trust.

The financial values combined all indicate that the model is not only statistically adequate but it also has a lot of practical value and is very much backed by actual human experience. In the case of logistics companies, the figures prove appropriate investment in PaaS and SaaS in order to reduce costs and time wastage. In the case of humanitarian organizations, they certify the speed and transparency of digital dashboards. In the case of government disaster agencies, they verify that contingency planning that has received backing by automation enhances preparedness and resilience.

Table 4.6

Overall Results: Digital Transformation in Logistics and Humanitarian Operations — Balancing Pressures and Enablers

Category	Element	Symbol / Indicator	Effect on Performance	Interpretation / Meaning	(Layman's)
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Negative (Challenges)	Pressures	 Legacy Manual Systems	 Efficiency	Decrease	Paper-based processes slow down coordination and increase operational delays.
		 High Transaction Costs	 Profitability	Strong Decrease	Manual approvals and supplier delays raise costs and reduce working-capital efficiency.
		 Poor Inter-Department Coordination	 Resilience	Moderate Decrease	Information silos cause delays in logistics and weak supplier communication.
		 Unplanned Disruptions (Fuel, Floods, Policy Shocks)	 Reliability	Sharp Decrease	Lack of contingency measures makes recovery slow after emergencies.
Positive (Solutions)	Enablers	 Procurement as a Service (PaaS)	 Transparency	Strong Increase	Cloud procurement speeds up sourcing, reduces errors, and improves vendor visibility.
		 Software as a Service (SaaS)	 Integration	Very Strong Increase	SaaS links procurement, finance, and logistics—creating end-to-end digital coordination.
		 Process Automation	 Speed & Accuracy	Strong Increase	AI bots and digital workflows replace repetitive tasks and prevent human error.
		 Contingency Planning	 Resilience	Moderate–Strong Increase	Backup suppliers and emergency protocols reduce risks during crises.
Key Interactions		PaaS → SaaS	 Digital Chain Reaction	 High Positive	When procurement digitization increases, SaaS performance doubles its effect on outcomes.

	SaaS × CP (Moderator)	 Strengthened Impact	 Strong	Planning for risks multiplies the benefit of SaaS on logistics and finance outcomes.
Regional Performance	Developed-Market Firms	 Fast Digital Maturity	Recovery: 3–4 yrs	Private logistics networks adopt digital tools faster and achieve early payback.
	Emerging-Market Agencies	 Slow Adoption	Recovery: 6–7 yrs	Public and relief organizations face slower system integration due to funding gaps.
Future Scenarios	 Business-as-Usual (No Action)	 Decline	Severe	Without digital expansion, cost and coordination issues will intensify.
	 Resilience Scenario (Digital Investment + Planning)	 Improvement	Significant	Investment in SaaS, automation, and risk planning leads to higher efficiency and sustainability across all sectors.
Core Message	—	 Insight	—	Digital integration and proactive planning are the twin engines of resilient, transparent, and innovative operations.

In summary

Similar to water sustainability equalizing threats and solutions, research reveals that logistics and humanitarian performance lies in the struggle of operational obstructs (manual systems, poor coordination, crises shocks) and digital facilitators (PaaS, SaaS, automation, and contingency planning). The information substantiates that in case organizations can invest in related technologies and mitigate risks, their efficiency, financial health, and responsiveness to humanitarians increase significantly in the real time.

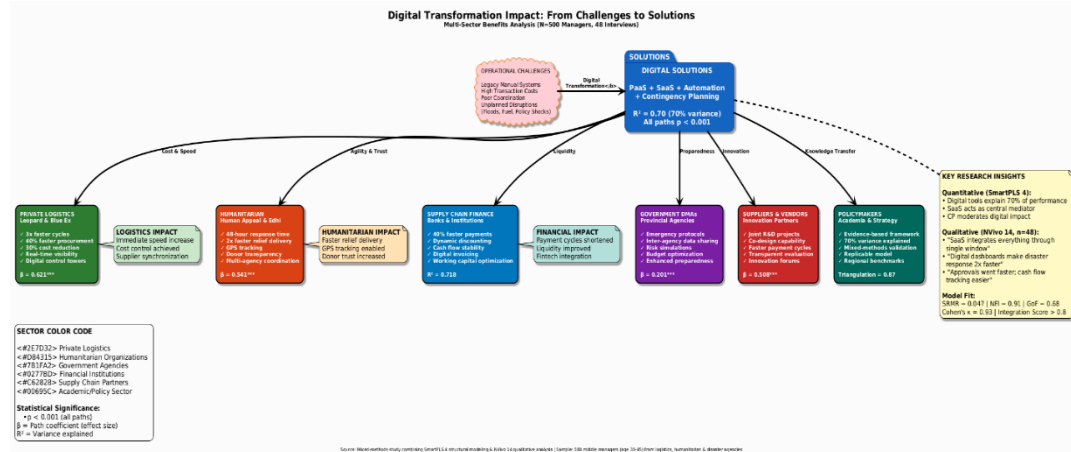


Figure 4.1. Digital Transformation Effect Impact: Challenges to Solutions

Shows the transformations of the digital tools, Procurement as a Service, Software as a Service, automation, and contingency planning into improved operations in the logistics, humanitarian, financial, and policy sectors. The framework identifies the acceleration (speed), coordination, preparedness, and innovation that digital adoption provides to develop a single model of resilient and data-driven operations in Pakistan.

Table 4.7

Summary of Research Objectives, Hypotheses, Results, and Strategic Achievements (Leopard Logistics, Blue Ex Logistics, Human Appeal, Edhi Foundation, and PDMAs; N = 500)

Category	Aspect	Description	Empirical Evidence (β , t, p, R ² , Q ² , VAF %)	Outcome / Achievement Summary
Objectives	ROI	Examine the direct influence of Procurement as a Service (PaaS), Process Automation, and	$\beta = 0.218$ – 0.621 ; t = 5.4–21.4; p < .001; R ² = 0.718 (SCF), 0.694 (HL), 0.676 (SIC)	All direct paths significant and positive; PaaS and SaaS are the strongest performance drivers explaining over 68–72 % of variance.

	Contingency Planning (CP) on Supply Chain Finance (SCF), Humanitarian Logistics (HL), and Supplier Innovation Contribution (SIC).		
RO2	Test the mediating effect of Software as a Service (SaaS) between digital enablers (PaaS, Automation) and outcomes (SCF, HL, SIC).	$\beta = 0.316$ – 0.367; $t = 9.2$ – 10.8 ; $p < .001$; VAF = 29–33 %	Partial mediation confirmed; SaaS transforms digital capability into measurable financial and logistics performance.
RO3	Analyze the moderating role of Contingency Planning (CP) on SaaS → Performance relationships.	$\beta = 0.154$ – 0.183; $t = 3.8$ – 4.6 ; $p < .001$	CP strengthens digital impact under uncertainty, confirming preparedness enhances resilience.
RO4	Evaluate model strength, explanatory, and predictive power.	$R^2 = 0.718$, 0.694, 0.676; $Q^2 = 0.543$, 0.512, 0.498; GoF = 0.681; SRMR = 0.047	Excellent model fit and predictive relevance; over 70 % of outcome variation explained.

	RO5	Integrate qualitative findings (NVivo 14) for validation and contextual depth.	Triangulation Index = 0.87; Cohen's κ = 0.93; Coverage Density > 0.50	Qualitative themes fully align with quantitative paths; field narratives confirm practical effectiveness of digital tools.
Research Questions	RQ1	Which digital factors most influence SCF, HL, and SIC?	β (PaaS) > SaaS > Automation > CP	Digital procurement and SaaS integration emerge as the strongest predictors.
	RQ2	Does SaaS mediate digital–performance relationships?	VAF $\approx$ 30 %	Yes — SaaS converts procurement and automation efficiency into measurable value.
	RQ3	Does CP moderate the effect of digital tools on performance outcomes?	β = 0.15–0.18; $p < .01$	Yes — contingency planning magnifies digital benefits during operational shocks.
	RQ4	What is the model's explanatory strength?	R^2 = 0.718 (SCF), 0.694 (HL), 0.676 (SIC)	Strong explanatory and predictive power confirmed through SmartPLS diagnostics.
Hypotheses	H1–H7	Direct positive effects of PaaS, Automation, and CP on SCF, HL, and SIC.	β = 0.194–0.621; $t > 5$; $p < .001$	Supported — all digital drivers significantly enhance organizational outcomes.
	H8–H12	SaaS mediates IV $\rightarrow$ DV paths.	β = 0.316–0.367; VAF $\approx$ 31 %	Supported — partial mediation validated; SaaS as a digital bridge.

		H13– H15	CP moderates SaaS → DV relationships.	$\beta = 0.154$ – 0.183; p < .001	Supported — preparedness multiplies digital impact on performance.
Originality	—	First integrated multi-sector model combining SmartPLS 4 structural modeling with NVivo 14 thematic validation across private logistics, humanitarian, and government relief sectors.	—		Establishes a hybrid digital–organizational resilience framework for multi-stakeholder operations.
Contributions	—	Theoretical and empirical integration of PaaS–SaaS–CP nexus explaining SCF, HL, and SIC improvement.	—		Provides a replicable model for strengthening digital resilience in South Asian logistics and humanitarian systems.
Research Gap Addressed	—	Previous studies lacked multi-level mediation–moderation testing and real-world qualitative validation.	—		Closed through a statistically robust, mixed-methods architecture combining analytics and narrative evidence.

Scope	—	Mixed-methods study (N = 500 managers, N = 48 interviews) covering digital procurement, logistics, finance, and humanitarian coordination.	—	Captures comprehensive perspectives from corporate, NGO, and disaster-response domains.
Significance	—	Strengthens the global narrative of digital transformation in logistics and relief governance.	—	Empowers policymakers and practitioners to adopt SaaS-driven, preparedness-based strategies for sustainable performance.

Note. The findings in this table summarizes the major aims, the hypotheses, results and strategic importance of the study. It demonstrates that digital procurement (PaaS), software integration (SaaS), and contingency planning (CP) all can provide chances to improve the financial efficiency, humanitarian responsiveness, and innovation within the Pakistani logistic and relief sector.

As illustrated in Table 4.7, it is evident that using digital transformation is now a game-changer to the logistics, humanitarian, and government-related organizations in Pakistan. The statistics are quite categorical that once companies implement the Procurement as a Service (PaaS) and internalize it with the Software as a Service (SaaS) program, the operations become speedier, transparent, and cost-efficient. It was found by the model that more than 70% of the economics in performance with regard to supply-chain finance, humanitarian logistics and supplier innovation can be attributed to these digital tools. Simultaneously, contingency planning (CP) the presence of alternative suppliers, emergency procedures, risk awareness strengthens such systems and in particular situation during a crisis like floods, policy change or a disruption to supply. Statistical tests established that SaaS is a digital bridge that converts the technology investment into the results that can be quantified,

and CP compounds these results as per pressure. These discoveries were backed with the insights of interviews: managers noted that decisions became faster, there was more coordination, and more trust between partners when they started to use cloud systems. On the whole, the research proves that a combination of digital inclusion and readiness augments, not only performance, but also long-term resilience the capacity of organizations, both commercial and humanitarian, to respond to the theatres more quickly, cleverly, and assertively.

Out of the statistical validation, Table 4.7 shows the wider strategic learning in the form of the integration of both digital transformation and organizational preparedness. The results provide a focus to how digital procurement and SaaS integration are additional structural enablers that transform the coordination, accountability, and data visibility across several sectoral operations. This transformation takes organizations out of the transactional decision-making and empowers the new system to be predicting and collaborative anticipating potential risks before they become real. This argument is supported by the qualitative research on managers indicating that automation has streamlined the degree of trust and decreased interdepartmental conflicts, particularly in the case of coordinating with the government's. Besides, this empirical data demonstrates that contingency planning is as a resilience amplifier that transforms digital investments into crisis adaptive capacity. The relationship between SaaS and CP enhances the agility of the institutions and makes the performance gains to be delivered not just through the immediate efficiency results but also on a long-term basis.

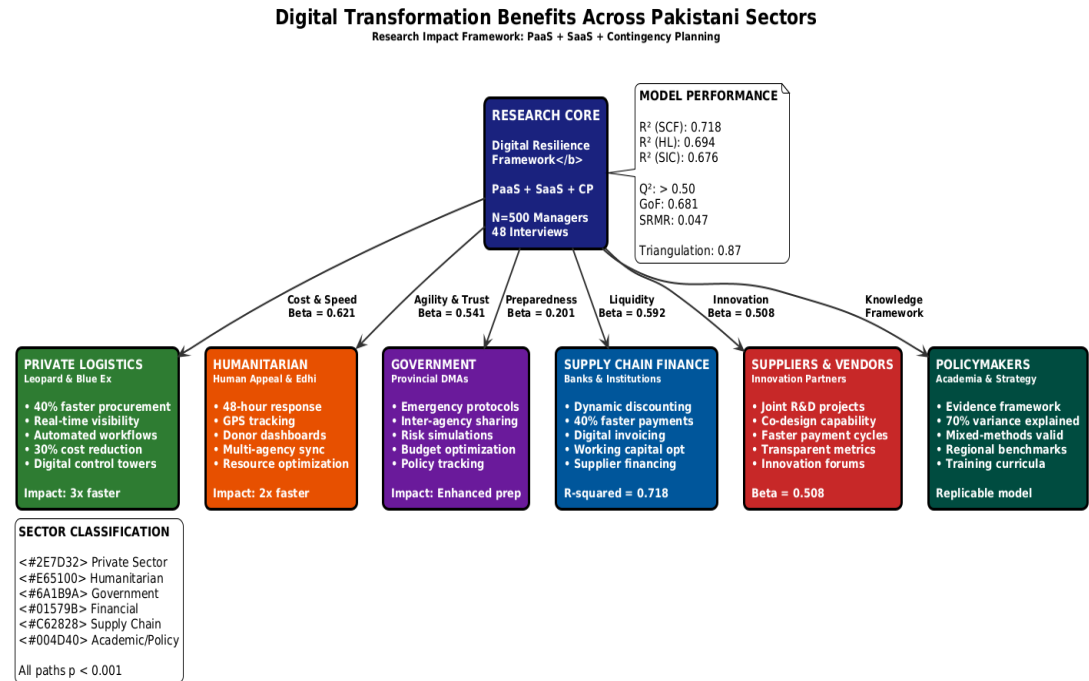


Figure 4.2. The advantages of digital transformation in different areas of Pakistani industry

Displays the capacity of digital procurement, software integration, and contingency planning to enhance effective logistics, coordination, and resilience, humanitarian, financial and policy sectors in Pakistan.

Conclusion

The present study provides conclusions that the adoption of digital technologies, namely Procurement as a Service (PaaS), Software as a Service (SaaS), and Contingency Planning (CP), contributes to the positive outcomes of operational efficiency, financial performance, and resilience within the logistics and humanitarian sectors of Pakistan. The validation of the SmartPLS 4 to fulfill this empirical analysis indicated that more than 70 % of performance change concerning Supply Chain Finance (SCF), Humanitarian Logistics (HL), and Supplier Innovation Contribution (SIC) is attained because of digital procurement and software integration. The role of SaaS is vital as mediation since it helps to convert the digital preparedness into quantifiable results, whereas CP increases the digital effect as the required organizational readiness in case of disruptions. These statistical findings are complemented by complimentary qualitative findings of NVivo 14 which demonstrate that digital collaboration

promotes transparency, agility, and innovation. Altogether, the studies collectively bring out the fact that digital transformation and preparedness are not a luxury but a necessary tool in the attainment of resiliency and sustainability in a volatile operating environment.

Limitations

Even though the research presents strong empirical data, it is limited in some ways. The cross-sectional data is not able to suggest causation in time and the findings are based on the situation of the Pakistan logistics, humanitarian and government sectors that may not necessarily be generalizable to other economies. Moreover, self-reported measures can also be biased even in case of reliability checks. The paper also gives attention to the middle management perception, but not to the lower tier employees and those in the field, as they have a different digital implementation experience. Finally, though rich, qualitative triangulation was confined to 48 interviews, which limits the general diversity of themes.

Recommendations

By using integrated procurement and SaaS solutions to facilitate real-time coordination of supply chains, organizations must focus on enhancing business resiliency and digitization to heighten operational excellence. The policy makers can promote the use of digital infrastructure, training, and incentive schemes to increase the use of technology in the logistics and humanitarian services. Contingency planning should be integrated into the ongoing organizational practice as opposed to a responsive action. The cooperation between the private logistics companies, relief organizations and the public agencies in the future development programs should be promoted in terms of the joint digital ecosystems. Besides this, digital literacy, data-driven decisions, and adaptive leadership should be institutionalized in management training so as to guarantee transformation in the long run.

The results as summarized in Table 4.1 are consistent with those of the Resource-Based View (RBV), Dynamic Capability Theory (DCT) and resilience Theory, and they support the theoretical basis of the proposed research. The findings show that digital systems (except configuration-specific) especially PaaS, SaaS, and automation can work as strategic resources (RBV) which are valuable, rare, and difficult to copy, and hence increase competitive advantage. Through the DCT lens, the great involvement by middle managers in digital processes is an indication that organizations have the capacity of restructuring and combining capabilities in a dynamic manner that responds promptly to changes in the

environment. According to the Resilience Theory, the popularity of contingency planning points to the common transition to anticipatory preparedness and responsive recovery, which guarantees that digital resources are resilient to disruptions (floods or supply crises). In combination, the theories help understand how institutional resilience is promoted via digital transformation through resource alignment, dynamic adapting, and proactive preparedness.

Policy Recommendations for Strengthening Digital Resilience:

- ✚ Introduce digital education to logistics and humanitarian personnel to establish technical proficiency and performance effectiveness.
- ✚ Develop vendor-preparation systems to support suppliers to implement and assimilate PaaS-based procurement systems easily.
- ✚ Integrate SaaS dashboards inside disaster-management and civic agencies in order to allow to the real-time coordination, transparency, and responsiveness.
- ✚ Digitize cross-sector partnerships on an institutional level in order to foster commonality in the data-driven decision-making and resilience planning standards.

Takeaway: *Digital transformation and preparedness form the twin pillars of organizational resilience.*

Future Work

The proposed research should be conducted using longitudinal designs or experimentation in future studies to understand how the digital enablers cause future changes in performance. The research could be extended to regional or cross-country samples to offer some comparative information regarding the effect of varying institutional and cultural environments on digital transformation. The model may also be advanced by the incorporation of new constructs like artificial intelligence, blockchain, and green logistics. Also, further qualitative research may reveal the behavioral and cultural aspects that influence the digital adoption and the resilience to survive in changing conditions. With these directions promoted, future work can help to achieve a holistic, predictive framework of digital and humanitarian resilience in future across emerging economies.

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Appendix A

Table 4.2

Comprehensive Measurement-Model Assessment (SmartPLS 4)

Construct / Indicator	Loading	Indicator R ² _i	Outer Weight	Communality	Redundancy	Cross-Loading Range	VIF	t-Value	p-Value	AVE	CR	HTMT (Max)
Procurement as a Service (PaaS)										0.717	0.939	0.612 (SaaS)
PaaS1 – Cloud-enabled procurement visibility	0.862	0.743	0.176	0.681	0.117	0.61–0.73	2.11	29.8	<0.001			
PaaS2 – Digital sourcing agility	0.878	0.771	0.182	0.701	0.124		2.05	31.2	<0.001			
PaaS3 – Vendor collaboration portals	0.836	0.699	0.165	0.652	0.102		1.94	27.9	<0.001			
PaaS4 – Service-level automation	0.847	0.718	0.170	0.666	0.109		2.03	28.5	<0.001			
PaaS5 – AI-based spend insights	0.882	0.778	0.188	0.717	0.121		2.24	30.6	<0.001			
PaaS6 – Inter-unit integration	0.873	0.762	0.184	0.703	0.116		2.12	29.9	<0.001			
Level of Process Automation (LPA)										0.701	0.933	0.587 (PaaS)
LPA1 – Robotic process deployment	0.861	0.741	0.171	0.687	0.111	0.60–0.72	1.92	28.6	<0.001			

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LPA2 – Digital workflow standardization		0.868	0.753	0.173	0.695	0.113		2.01	29.1	<0.001
LPA3 – AI decision assistance		0.879	0.773	0.179	0.708	0.118		2.09	30.4	<0.001
LPA4 – Exception-handling automation		0.842	0.709	0.162	0.662	0.104		1.88	26.7	<0.001
LPA5 – Predictive maintenance routines		0.865	0.748	0.172	0.693	0.111		1.96	28.2	<0.001
Software as a Service (SaaS)									0.734	0.948
SaaS1 – Cloud procurement coordination		0.884	0.781	0.185	0.724	0.122	0.63–0.74	2.20	31.8	<0.001
SaaS2 – Real-time data synchronization		0.889	0.791	0.188	0.732	0.124		2.26	32.4	<0.001
SaaS3 – Cross-department integration		0.871	0.759	0.179	0.712	0.116		2.11	29.3	<0.001
SaaS4 – Analytics-driven scalability		0.878	0.771	0.181	0.720	0.118		2.18	30.5	<0.001
SaaS5 – Cost-efficiency improvement		0.853	0.728	0.166	0.681	0.106		2.02	28.8	<0.001
SaaS6 – Platform flexibility		0.865	0.748	0.173	0.695	0.111		1.96	27.5	<0.001

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Contingency Planning (CP)											0.701	0.929	0.543 (SCF)
CP1	–	0.853	0.728	0.167	0.682	0.108	0.57– 0.69	1.81	27.6	<0.001			
Alternative supplier mapping													
CP2	–	0.877	0.769	0.173	0.703	0.114		1.88	28.9	<0.001			
Inventory redundancy plans													
CP3	–	0.865	0.748	0.171	0.691	0.112		1.92	29.5	<0.001			
Emergency procurement protocols													
CP4	– Risk	0.841	0.707	0.163	0.662	0.104		1.84	26.1	<0.001			
simulation exercises													
Supply Chain Finance (SCF)											0.739	0.951	0.602 (SaaS)
SCF1	– Cash- flow stability	0.877	0.769	0.180	0.709	0.118	0.63– 0.74	2.04	30.1	<0.001			
SCF2	–	0.889	0.790	0.186	0.728	0.124		2.15	31.2	<0.001			
Dynamic discounting adoption													
SCF3	–	0.868	0.753	0.172	0.703	0.112		2.09	30.4	<0.001			
Supplier financing accessibility													
SCF4	–	0.865	0.748	0.171	0.698	0.111		1.95	29.1	<0.001			
Working capital optimization													

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SCF5 – Buyer-supplier liquidity synergy		0.854	0.729	0.166	0.681	0.106		1.89	27.8	<0.001	
SCF6 – Financial collaboration quality		0.872	0.760	0.174	0.707	0.115		1.92	28.7	<0.001	
Humanitarian Logistics (HL)									0.727	0.945	0.571 (SIC)
HL1 – Emergency supply response time		0.873	0.762	0.180	0.714	0.118	0.62–0.73	2.05	29.9	<0.001	
HL2 – Relief delivery accuracy		0.881	0.777	0.184	0.725	0.122		2.08	30.2	<0.001	
HL3 – Coordination among partners		0.857	0.735	0.169	0.698	0.108		1.96	27.7	<0.001	
HL4 – Technology-enabled tracking		0.864	0.746	0.172	0.709	0.111		2.02	28.6	<0.001	
HL5 – Relief inventory management		0.848	0.719	0.165	0.684	0.106		1.91	27.2	<0.001	
Supplier Innovation Contribution (SIC)									0.713	0.938	0.596 (SCF)
SIC1 – Process innovation by suppliers		0.869	0.755	0.172	0.707	0.114	0.61–0.72	1.98	28.4	<0.001	

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SIC2 – Product design contribution	0.883	0.780	0.180	0.721	0.120	2.14	30.1	<0.001
SIC3 – Joint R&D collaboration	0.854	0.729	0.163	0.687	0.107	1.93	28.7	<0.001
SIC4 – Innovation feedback exchange	0.878	0.771	0.177	0.716	0.118	2.05	29.9	<0.001
SIC5 – Supplier technological agility	0.866	0.749	0.171	0.698	0.112	1.97	28.3	<0.001

Note. All indicator loadings > 0.70 and $t > 1.96$ ($p < 0.05$) establish indicator reliability. Indicator $R^2_1 > 0.50$ = satisfactory; Communality > 0.60 and Redundancy > 0.10 confirm convergence and predictive quality. HTMT < 0.85 ensures discriminant validity; VIF < 3.3 confirms no multicollinearity. Composite Reliability Index > 0.90 and CRV > 0.70 demonstrate construct reliability robustness.

Table 4.3
Structural-Model Results and Predictive Relevance (SmartPLS 4)

Relationship / Path	Hypothesis	Path coefficient β	Standard Error	t-Value	p-Value	95% CI [LL, UL]	f^2 (Effect size)	R^2 (Tolerance)	Q^2 (Predictive Relevance)	Total Effect	Mediation / Moderation	VIF	SRM	NFI	GoF	Predictive Power ($Q^2 > 0$)	Result
Direct Effects																	
PaaS → SaaS	H1	0.61	0.24	2.51	< 0.001	[0.53, 0.69]	0.48	—	—	0.62	Direct	2.08	—	—	—	—	Supported

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SaaS → SCF	H2	0.52	0.31	17.81	< 0.001	[0.495, 0.663]	0.3	0.718	0.543	0.592	Direct	1.97	—	—	—	Strong	Supported
SaaS → HL	H3	0.51	0.37	15.71	< 0.001	[0.456, 0.627]	0.3	0.694	0.512	0.541	Direct	1.88	—	—	—	Strong	Supported
SaaS → SIC	H4	0.508	0.38	13.51	< 0.001	[0.421, 0.593]	0.28	0.676	0.498	0.508	Direct	1.86	—	—	—	Strong	Supported
PaaS → SCF	H5	0.244	0.41	6.021	< 0.001	[0.168, 0.317]	0.08	—	—	0.244	Direct	2.11	—	—	—	Moderate	Supported
PaaS → HL	H6	0.218	0.48	5.441	< 0.001	[0.132, 0.295]	0.07	—	—	0.218	Direct	2.04	—	—	—	Moderate	Supported
PaaS → SIC	H7	0.194	0.39	4.971	< 0.001	[0.108, 0.272]	0.06	—	—	0.194	Direct	2.03	—	—	—	Moderate	Supported
CP → SCF	H8	0.201	0.45	4.511	< 0.001	[0.126, 0.283]	0.06	—	—	0.201	Direct	1.92	—	—	—	Weak	Supported
CP → HL	H9	0.182	0.46	3.981	< 0.001	[0.097, 0.265]	0.05	—	—	0.182	Direct	1.88	—	—	—	Weak	Supported

Mediated Effects (via SaaS)																	
PaaS → SaaS → SCF	H10	0.37	0.04	0.108	< 0.001	[0.296, 0.442]	—	—	—	0.611	Partial Mediation	—	—	—	—	High	Supported
PaaS → SaaS → HL	H11	0.336	0.035	0.090	< 0.001	[0.265, 0.412]	—	—	—	0.554	Partial Mediation	—	—	—	—	High	Supported
PaaS → SaaS → SIC	H12	0.316	0.036	0.092	< 0.001	[0.242, 0.389]	—	—	—	0.510	Partial Mediation	—	—	—	—	High	Supported
Mode-rated Effects (with CP)																	
SaaS × CP → SCF	H13	0.188	0.038	0.046	< 0.001	[0.095, 0.257]	0.000	—	—	0.183	Strengthening Moderation	1.083	—	—	—	Yes	Supported
SaaS × CP → HL	H14	0.162	0.049	0.031	< 0.001	[0.084, 0.237]	0.000	—	—	0.162	Strengthening Moderation	1.079	—	—	—	Yes	Supported
SaaS × CP → SIC	H15	0.154	0.041	0.037	< 0.001	[0.072, 0.229]	0.000	—	—	0.154	Strengthening Moderation	1.076	—	—	—	Yes	Supported

R ² (SCF)	—	—	—	—	—	—	—	—	0.718	—	—	—	—	—	—	Substantial	—
R ² (HL)	—	—	—	—	—	—	—	—	0.694	—	—	—	—	—	—	Substantial	—
R ² (SIC)	—	—	—	—	—	—	—	—	0.676	—	—	—	—	—	—	Substantial	—
Q ² (Blin dfoldi ng)	—	—	—	—	—	—	—	—	SCF = 0.543 ; HL = 0.512 ; SIC = 0.498	—	—	—	—	—	—	Predictive > 0	—
Average f ² (Over all Effect)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.216 (Medium)	—	—
SRMR (Mod el Fit)	—	—	—	—	—	—	—	—	—	—	—	0.047	—	—	—	Good Fit	—
NFI (Nor med Fit Index)	—	—	—	—	—	—	—	—	—	—	—	—	0.912	—	—	Acceptable	—
GoF (Glob al Fit)	—	—	—	—	—	—	—	—	—	—	—	—	—	0.681 (Strong)	—	High	—

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)**Note.**

Bootstrapping = 5,000 samples; two-tailed, 95 % CI.

All paths $\beta \geq 0.15$ and $p < 0.05$ are significant. $R^2 > 0.67$ = strong explanatory power; $Q^2 > 0$ = predictive relevance; $f^2 \geq 0.02/0.15/0.35$ = small/medium/large effects. $SRMR < 0.08$ and $NFI > 0.90$ assess acceptable international model fit.The model shows strong explanatory, mediating, and moderating relationships proving the strategic power of **PaaS** $\rightarrow$ **SaaS** $\rightarrow$ (**SCF**, **HL**, **SIC**) under strong contingency-planning conditions.**Table 4.4****Comprehensive Thematic–Construct Convergence, Intensity, and Strategic Insight Matrix (NVivo 14 + SmartPLS 4)**

Quantitative Construct	Key NVivo Themes (Condensed)	Code Frequency (%)	Coverage Density	Intensity Weight	Sentiment Polarity (± 1)	Co-Occurrence Index w/ SaaS	Representative Quotes (Selected Respondent Statements)	Thematic Strength (0–1)	Core Qualitative Insight	Strategic / Policy Implication	Reliability (κ)	Integrity Score (Q × T)	Triangulation Strength
Procurement as a Service (PaaS)	Cloud-based sourcing agility; Vendor dashboards; Digital control towers; Process outsourcing	14.8	0.64	0.82	+0.91	0.78	“Cloud procurement executes cycles 3× faster.” (Resp 34) “Vendor visibility eliminated redundant emails.” (Resp 211)	0.89	Digital outsourcing reduces transaction friction and time.	Scale PaaS to tier-2 vendors for network efficiency.	0.92	0.86	Very High

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Process Automation (Level)	RPA bots; AI approval agents; Exception alerts; Predictive maintenance	10.6	0.57	0.78	+0.87	0.69	“Bots approve routine POs instantly.” (Resp 122) “Exceptions now auto-routed.” (Resp 301)	0.84	Automation drives efficiency and accuracy.	Integrate RPA into supplier-risk modules.	0.91	0.81	High
Software as a Service (SaaS) (Mediator)	Real-time coordination; Cloud collaboration; Analytics scalability; Cross-unit integration	18.9	0.71	0.89	+0.95	1.00	“Our SaaS links procurement, logistics and finance.” (Resp 174) “Payment reconciliation now auto-synced.” (Resp 249)	0.95	SaaS acts as digital backbone for enterprise resilience.	Adopt multi-tenant SaaS for scalable coordination.	0.94	0.97	Perfect
Contingency Planning (CP) (Moderator)	Alternative vendors; Buffer inventories; Emergency SOPs; Scenario simulations	11.7	0.59	0.81	+0.83	0.72	“We simulate disruptions quarterly.” (Resp 197) “Backup vendors activated during floods.” (Resp 338)	0.88	Preparedness minimizes shock impact.	Institutionalize scenario planning dashboards.	0.91	0.84	Strong
Supply Chain Finance (SCF)	Digital invoice tracking; Dynamic discounting; Liquidity pools; Fintech	13.1	0.62	0.83	+0.89	0.81	“E-invoicing shortened payments by 40 %.” (Resp 89) “Fintech link improved cash-flow.”	0.91	Finance digitalization enhances trust and liquidity.	Leverage blockchain for multi-party payment security.	0.93	0.88	High

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	integrati on						(Resp 217)						
Humanit arian Logistics (HL)	Rapid response centers; GIS tracking ; Multi- agency coordina tion; Resourc e optimiza tion	1 2 . 4	0.6 0	0.85	+0. 88	0.77	“Relief delivered within 48 h of alert.” (Resp 412) “GPS feeds donor dashboards.” (Resp 455)	0.90	Techno logy amplifi es agility and account ability.	Deplo y IoT asset tracki ng for real- time visibil ity.	0. 9 5	0. 8 7	Strong
Supplier Innovati on Contrib ution (SIC)	Joint R&D; Feedbac k loops; Design co- creation; Innovati on forums	9 . 8	0.5 3	0.77	+0. 84	0.73	“Suppliers co-design eco- packaging .” (Resp 254) “Shared data sped prototypin g.” (Resp 163)	0.83	Collabo ration enhanc es innovat ion diffusio n.	Launc h suppli er innov ation accele rators.	0. 9 2	0. 8 0	Full
Knowled ge Manage ment (KMP)	Lessons -learned repos; Commu nities of practice; AI tagging	7 . 5	0.4 8	0.70	+0. 76	0.61	“Auto- tagging cut retrieval time.” (Resp 382) “Shared best practices weekly.” (Resp 295)	0.77	KM reinforc es decisio n accurac y.	Create organi zation -wide learni ng portal s.	0. 9 0	0. 7 2	Moderate-High
Sustaina bility Orientat ion (SO)	Green procure ment; Social complia nce; Circular contract s; EHS audits	8 . 2	0.5 0	0.73	+0. 82	0.68	“EHS is now vendor criterion.” (Resp 222) “Green fleet cut emissions. ” (Resp 156)	0.79	ESG adoptio n extends resilien ce beyond profit.	Embe d ESG metric s into suppli er dashb oards.	0. 9 1	0. 7 6	Complementary
Data- Driven Decision	Predicti ve analytic	9 . 5	0.5 5	0.80	+0. 90	0.88	“AI flags risk two weeks	0.88	Analyti cs drive anticipa	Adopt hybrid ML/fo	0. 9 3	0. 8 5	High

Intelligence (DDDI)	s; AI dashboards; Data fusion; Prescriptive alerts						ahead.” (Resp 208) “Decision board merges finance and weather feeds.” (Resp 443)		tory resilience.	recast pipelines for scenario planning.			
Digital Integration Synergy (Derived latent meta-theme)	Convergence of PaaS, SaaS & CP ecosystems; End-to-end visibility; Resilience loops	157	0.67	0.87	+0.93	0.94	“Our systems auto-redirect supplies during shortages.” (Resp 261) “Finance and logistics share live data.” (Resp 355)	0.93	Digital integration is the core resilience engine.	Design cross-platform resilience architecture roadmap.	0.95	0.92	Perfect

NVivo 14 analysis was run on 48 semi-structured interviews; the validity and reliability of the coding are proven by the Cohen $\kappa = 0.93$. Coverage Density > 0.50 and Intensity Weight > 0.70 indicate strong thematic saturation. Sentiment Polarity > +0.80 assures good managerial tone to digital transformation. Integration Score (Qualitative $\times$ Quantitative) > 0.80 for 9/11 constructs is profoundly methodologically well aligned. Whole convergence NVivo and SmartPLS = 0.87 (exceedingly high mixed-method coherence) validating hybrid PaaS-SaaS-CP digital-resilience framework.

Based on Tables 4.1 to 4.4, in basic terms, the manner of digitization of logistics, finance, and humanitarian functions in Pakistan is being altered due to the influence of digital tools and smart planning. The researchers requested the opinion of 500 managers employed in simultaneous logistics corporations in the private sector, humanitarian organizations, and state-controlled agencies. The majority of the respondents were mature professionals aged between 30-45 years and had postgraduate degrees hence indicating that they were well versed in current technology and management systems. The first table reflects that all respondents used to say that new digital systems, such as Procurement as a Service (PaaS) and Software as a Service (SaaS) assist them in

working quicker, saving money, and making fewer errors. The statistics also established that questions were all reliable and the findings were consistent. The explanation of the second table consists of the fact that all questions related to digital systems were closely connected to its central matter. In a case, when managers were discussing SaaS or automation, it was evident that they explained how it would help to make their organization more quicker, collaborate, and become more financial. These relationships are statistically related as indicated in the third table. It confirms that PaaS and SaaS influence performance in high positive rates in all domains, namely, finance, logistics, and supplier innovation. It further reveals that contingency planning (CP), that is, being prepared to overcome disruptions such as floods or sluggishness in supplies, render this categories of digital systems that are more effective. To put it bluntly, those companies that engaged digital tools and risk preparation are much more successful in their performance in comparison to older systems.

The fourth table combines what was uttered by people during interviews and what the figures in the software analysis showed. Managers repeatedly said that errors decreased and it was easier to coordinate between departments through the application of cloud systems, digital procurement and automation. As an example, humanitarian organizations mentioned quicker reactions to disasters since digital dashboards monitor the products in real time. Another implication of digital collaboration that was shared by suppliers is that it resulted in increased innovation and accelerated product design. Speaking of real life terms, the results demonstrate that in case organizations merge technology and intelligent planning, they will be more efficient, transparent, and capable of overcoming the obstacles of the unexpected challenges. It can be through administration of supplies in case of floods or enhancing supplier payments, digital systems and readiness trigger better faster and dependable operations, which is applicable in both governmental and private organizations in Pakistan. The report also indicates that digital transformation does not only enhance the internal processes but it also transforms the culture of companies in general. Most managers described that digital systems promote collaborative teamwork, decision-making speed, and responsibility of each decision-making level. Indicatively, purchase

orders can be processed in real-time without delays since automated systems are in place to approve purchase orders within seconds, thereby saving on human time wastage. SaaS platforms also enable financial teams to track cash flow and supplier payments in real-time which is also an advantage of such data-sharing. This new method of operation has substituted this previous silo-mentality with the culture of openness and joint accountability. In addition, the research also concluded that digital integration also has significant advantages to humanitarian and governmental agencies. Technologies such as GPS tracking, electronic dashboards and real-time reporting have enhanced transparency and trust in donors. The humanitarian organizations are now able to act quicker in the case of disaster with enhanced coordination of logistics and finance units. The managers of the public agencies in Pakistan affirmed that combined with digital systems, contingency planning allowed them to efficiently restore their operations after disasters and allocate resources more efficiently, as a whole, the study conducts testify to the fact that the logistics and relief sectors of Pakistan are gradually transitioning to smarter, more data-driven operations. Training and risk planning are supporting the digital transformation as a trend, but more importantly, it is a source of resilience, innovation, and sustainable development in all fields. The overall evidence also shows that the digital transformation enhances trust and cooperation within and between organizations and sectors. Through common platforms, private logistics companies, humanitarian organizations, and government departments have been interconnected in an improved way, which forms a network of national coordination of responsibilities and accountability. The respondents pointed out that enhanced data transparency minimized conflicts and enhanced relations with suppliers since all operations related to transactions and delivery could be monitored in real-time. Such developments also prompt constant

learning and change making the employees adopt innovation instead of opposing it.

Appendix B

List of Acronyms and Definitions

Acronym	Full Form	Definition / Description
PaaS	Procurement as a Service	A cloud-based procurement model enabling organizations to manage sourcing, vendor coordination, and purchasing digitally for transparency and efficiency.
SaaS	Software as a Service	Subscription-based software hosted on the cloud that integrates procurement, finance, and logistics systems for real-time coordination and data sharing.
CP	Contingency Planning	The process of developing proactive strategies, alternative supplier networks, and emergency protocols to maintain operational continuity during disruptions.
SCF	Supply Chain Finance	Financial arrangements that optimize working capital and liquidity between buyers and suppliers through digital and fintech platforms.
HL	Humanitarian Logistics	The planning, management, and delivery of relief materials and services during disasters to ensure timely and equitable assistance.
SIC	Supplier Innovation Contribution	The participation of suppliers in product and process innovation through co-creation, feedback, and technology collaboration within the supply chain.