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Informal Internet Service Providers and Their Potential Role in Promoting Digital Marketing and E-Payments in Gaza: A Case Study Report

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Abbreviations and Acronyms

ATM	Automated Teller Machine
GC	Global Communities
E-Payment	Electronic Payment
ISP	Internet Service Provider
KII	Key Informant Interview
KYC	Know Your Customer
MAS	Palestine Economic Policy Research Institute
MSMEs	Micro, Small, and Medium Enterprise(s)
MTIT	Ministry of Telecommunication and Information Technology
NGOs	Non-Governmental Organizations
PalPay	Palestinian financial technology company and electronic payment solution provider
Paltel	Palestine Telecommunications Company
PCBS	Palestinian Central Bureau of Statistics
QR Code	Quick Response Code
USSD	Unstructured Supplementary Service Data
Wi-Fi	Wireless Fidelity

Executive Summary

The prolonged collapse of Gaza's telecommunications, banking, and commercial infrastructure fundamentally reshaped how people accessed digital services, conducted business, and sustained income. Palestinian Central Bureau of Statistics (PCBS) (May, 2025) reported that an estimated 64% of mobile towers were out of service, and large parts of the fixed-line network were disrupted, formal Internet Service Providers (ISPs) struggled to operate. In this vacuum, informal ISPs, MSMEs, freelancers, and digital payment users created adaptive systems that enabled essential communication and economic continuity despite severe constraints.

This case study report, developed by MAS in partnership with Global Communities (GC) and funded by the Swedish Government, documents seven narrative-based case stories illustrating how Gaza's digital economy functioned during extreme infrastructure disruption. The report draws on field interviews with informal and formal ISPs, MSMEs, digital service providers, government stakeholders, and community members, and provides an evidence-based account of the operational realities faced on the ground.

Across all seven cases, a consistent set of themes emerges. Informal ISPs became the core operational backbone of Gaza's digital ecosystem when formal networks collapsed. These providers scaled rapidly, maintained basic bandwidth distribution, and served as essential enablers of digital activity for households and businesses. In several cases, informal actors established coordination models that resembled de facto regulatory systems. Some of these early mechanisms later aligned with formal initiatives, most notably Paltel "*Almubadra"*, which institutionalized and scaled coordination with reseller networks.

MSMEs demonstrated significant adaptability by shifting to low-tech digital commerce, using simple tools such as WhatsApp, Facebook, and photo-based catalogues to manage sales and customer communication. Women-led micro-enterprises and small shops without physical premises reorganized their business models around digital visibility and informal delivery networks, allowing them to maintain essential revenue flows during displacement.

Digital payments, especially through PalPay, became a critical financial lifeline. With cash circulation severely restricted and banking systems offline, online banking applications and e-wallets provided the most reliable mechanism for completing transactions. MSMEs, freelancers, and households used digital wallets to receive payments, make purchases, and manage small-scale financial flows. PalPay and Jawwal Pay operational continuity enabled the emergence of closed-loop digital economies in some neighborhoods and shelters.

Freelancers formed connectivity clusters around informal access points, using low-bandwidth tools to maintain regional and international work relationships and generate income for their families. Even minimal connectivity enabled continued participation in global digital labor markets, illustrating the economic importance of remote work capacity in crisis settings.

Across all cases, resilience was driven not by advanced technology but by improvisation, community support systems, decentralized operations, and flexible digital tools. Informal ISPs rebuilt networks using salvaged equipment, MSMEs restructured operations using simple digital communication, and digital wallets substituted for collapsed cash infrastructure. These informal, adaptive systems collectively sustained a functioning digital economy under conditions of severe disruption.

The report concludes that Gaza's digital resilience is anchored in hybrid informal–formal models, community-driven coordination, and low-tech digital practices that complement rather than replace formal infrastructure. As Gaza enters a reconstruction phase, strengthening partnerships between informal ISPs and formal providers, expanding reliable digital payment channels, and supporting MSMEs' digital capabilities will be essential for building a more resilient, inclusive digital economy.

These findings provide actionable insights for policymakers, development partners, and private-sector actors seeking to design recovery strategies that reflect the operational realities of Gaza's digital ecosystem and the vital role played by informal connectivity and digital finance during crisis. Key actionable insights include:

- Informal ISPs as Critical Infrastructure: Formal recognition and structured integration through flexible licensing, emergency partnerships, and equipment support can transform informal providers into a resilient layer of national telecom infrastructure.
- MSMEs: Prioritizing low-tech digital tools for MSMEs, coupled with community logistics and e-payment integration, to sustain commerce under constraints.
- Digital Payments as Emergency Financial Systems: Strengthen agent networks, ensure liquidity pools, and simplify KYC during crises. Integrate e-wallets with MSME operations via QR codes and micro-invoicing to sustain cashless businesses.
- Hybrid Formal and Informal Governance: Encourage formal telecom and finance providers to co-design emergency protocols with informal networks. Use hybrid models as blueprints for regulatory reform and crisis preparedness.
- Freelancers and Remote Work Resilience: Establish solar-powered co-working hubs in high-risk areas, provide micro-grants for device fees, and partner with global platforms to waive fees or adjust service terms for crisis-affected freelancers.
- Community-Based Coordination as a Resilience Engine: Fund and train community digital champions. Support mesh networks and decentralized infrastructure to reduce dependency on centralized systems.
- Gender-Inclusive Digital Recovery: Create women-focused digital hubs, offer tailored e-payment and micro-finance products, and ensure women are represented in digital economy planning committees.
- Decentralized and Renewable Energy-Dependent Infrastructure: Invest in renewable energy kits for ISPs and MSMEs. Promote decentralized network designs (mesh, community Wi-Fi) to enhance system-wide resilience.
- Policymaker and Donor Coordination: Establish a multi-stakeholder Digital Resilience Working Group (government, banks, NGOs, donors) to align recovery efforts and mobilize resources for integrated support programs.

1. Introduction & Background

Gaza's digital economy has undergone a significant transformation under the conditions of prolonged conflict, infrastructure collapse, and widespread displacement. The destruction of telecommunications networks, commercial supply chains, and cash-based financial systems created an environment in which traditional business operations and formal digital services could no longer function reliably. In this context, informal Internet Service Providers (ISPs), Micro, Small, and Medium Enterprises (MSMEs), freelance workers, and digital payment platforms emerged as critical actors sustaining essential economic and communication activities.

The crisis exposed the profound vulnerability of Gaza's formal telecommunications infrastructure, which is structurally weak, reliant on Israeli-controlled infrastructure, and severely restricted in technological development (Mourtada, 2025). By early 2025, nearly 64% of mobile network towers were out of service, and fixed-line connectivity remained heavily degraded (Palestinian Central Bureau of Statistics, 2025). This fragile system has been subjected to repeated, near-total telecommunications blackouts, plunging the population into digital darkness for days at a time and isolating them from communication, emergency services, and the outside world (EFF, 2025). Entire neighborhoods experienced extended periods without any functional formal internet coverage. Formal ISPs faced extensive damage to fiber routes, power supply infrastructure, switching equipment, and distribution cabinets. As a result, thousands of households, businesses, and humanitarian actors were cut off from the digital services required for communication, coordination, and financial transactions.

Within this vacuum, informal ISPs that previously operated at the margins of the telecommunications market rapidly assumed a central role. These operators, working with limited resources and improvised infrastructure, provided the only accessible connectivity for large segments of the population. Their networks enabled displaced families to communicate with relatives, allowed small businesses to receive orders, facilitated digital payment transfers, and supported humanitarian coordination. In some areas, informal ISPs effectively became the primary source of operational connectivity, serving as emergency digital infrastructure when formal systems were non-functional.

MSMEs faced similarly severe disruptions. Physical shops were destroyed or inaccessible, supply chains were fragmented, and formal delivery services were largely unavailable. Despite these challenges, many MSMEs adapted their operations through simple digital tools and community-based logistics. Microbusinesses used WhatsApp and Facebook to manage orders, relied on informal ISPs for minimal connectivity, and used e-wallet systems to complete transactions amid cash shortages. These adaptations represent a form of low-tech digital transformation driven by necessity rather than strategic planning.

Digital payments became an essential economic enabler during the collapse of cash infrastructure. With banking systems offline, ATMs destroyed, and cash circulation restricted, online banking applications and e-wallets, particularly PalPay, Jawwal Pay, and Bank of Palestine, provided households and MSMEs with a functional financial alternative. These platforms allowed individuals to send and receive funds, merchants to process transactions, and humanitarian actors to deliver assistance. Digital finance thus played a key role in maintaining economic continuity at the household and community level.

Freelancers and remote workers were another critical group affected by the crisis. Many relied on connectivity to access regional and international clients and digital labor markets. Despite bandwidth limitations and a documented environment of online censorship and shadow-banning of Palestinian content, freelancers reorganized their workflows around informal ISP access points, forming small working hubs and using low-bandwidth tools to remain active in the regional and global markets (7amleh, 2024). Their continued income generation provided economic support to households and contributed to local micro-economies inside displacement sites.

This case-study report, commissioned to the Palestine Economic Policy Research Institute (MAS) in partnership with Global Communities and funded by the Swedish Government, aims to document these lived experiences through seven narrative-driven case stories. The objective is to demonstrate how informal ISPs, MSMEs, freelancers, and digital payment users adapted their operations and sustained essential digital activities under extreme conditions. Rather than focusing solely on technical assessments, the report highlights human-centered operational realities and provides insights into the economic, social, and technological behaviors that emerged during the crisis.

By examining how Gaza's digital ecosystem functioned without reliable formal infrastructure, the report offers practical lessons for humanitarian actors, policymakers, and private-sector stakeholders. It underscores the importance of decentralized connectivity, low-tech digital commerce, and flexible financial tools as components of digital resilience. As Gaza moves toward recovery and reconstruction, understanding these informal systems and the adaptive behaviors that supported them will be critical for designing effective, context-sensitive digital economy interventions (Wilson Center, 2024). The profound social resilience demonstrated by communities, often the only remaining foundation for survival as institutional and physical structures failed, must be central to any planning for the future.

2. Scope and Objectives

2.1 Scope of the Study

This study provides a qualitative, in-depth examination of the adaptive digital practices within the Gaza Strip, with a particular focus on the period following the severe degradation of formal telecommunications infrastructure. The geographical scope is confined to Gaza's governorates, where the phenomena of informal connectivity provision and digital business adaptation are most pronounced.

The report centers on the intersection of three critical actors: the operational ecosystem of informal ISPs, the survival strategies of MSMEs, and the utilization of digital marketing and e-payment tools. Primary data was gathered directly from owners and operators in the leading digital business services groups, ensuring the findings are grounded in lived experience. The report is explicitly narrative-driven, aiming to humanize complex systemic issues through detailed case stories rather than statistical generalization, thereby providing actionable insights for policymakers and practitioners.

2.2 Study Objectives

The primary objective of this consultancy was to produce an evidence-based, narrative-driven case study that documents and analyzes the critical role of informal ISPs in sustaining Gaza's digital economy amidst adversity. This central aim was operationalized through the following specific objectives:

1. To identify, document, and analyze the operational models, technological adaptations, service areas, and primary challenges faced by informal ISPs in Gaza.
2. To illustrate, through detailed case stories, how MSMEs leverage connectivity from informal ISPs to employ digital marketing and e-payments for business continuity.
3. To highlight the resilience and innovation of actors within this ecosystem, while critically examining the interconnected challenges they face, including connectivity costs, reliability issues, regulatory uncertainty, and security risks.
4. To generate actionable insights for recovery: To synthesize findings into coherent narratives and analyses that can inform future policy advocacy, regulatory frameworks, and support programs aimed at enhancing the resilience and inclusivity of Gaza's digital economy.

3. Methodology

This report employed a qualitative, narrative-driven case study approach to investigate the role of informal ISPs in enabling digital marketing and e-payments for MSMEs in the Gaza Strip. The methodology was designed to capture rich, contextual, and human-centered data on resilience and adaptation within a complex and fragile environment.

3.1 Design and Rationale

A case study design was selected as the most appropriate method to explore the "how" and "why" of a contemporary phenomenon within its real-life context. Given the informal and emergent nature of the subject, a flexible, qualitative approach was prioritized over quantitative measures to allow for the depth, nuance, and personal narratives essential for advocacy and policy insight. The core objective was to generate detailed case stories that illuminate the interdependencies between informal ISPs and MSMEs.

3.2 Sampling and Participants Selection

A purposive sampling strategy was used to identify information-rich participants who could provide diverse and in-depth perspectives on the core research themes (List of Key Informants Interviewed (KII) provided in Annex (1). The study engaged three primary respondent groups:

1. Informal ISP Operators: Selected to represent variation in operational scale, technology, and geographical location across Gaza's governorates.
2. MSME Owners: Drawn from sectors actively utilizing digital tools (e.g., retail, food services, freelancing) to ensure relevant insights into adaptation strategies.
3. Key Informants: Including representatives from regulatory bodies, telecommunications associations, individuals (freelancers and entrepreneurs), and financial service providers to contextualize the ecosystem.

3.3 Data Collection Procedures

Primary data was collected over a three-week fieldwork period through the following methods:

- Semi-Structured Interviews: A total of 18 interviews were conducted using tailored guides for each respondent group. Interviews focused on operational models, daily challenges, adaptive practices, and lived experiences.
- Narrative Elicitation: Interview techniques emphasized open-ended, storytelling questions (e.g., "Can you tell me about a specific day when the internet failed during a critical transaction?") to move beyond abstract answers and gather concrete, narrative data.
- Desk Review: Preliminary analysis of existing reports on Gaza's telecoms infrastructure, digital economy, and humanitarian context informed the research framework and interview guides.

3.4 Data Analysis

All interview data were transcribed and analyzed using a structured thematic analysis process:

1. Familiarization and Coding: Transcripts were reviewed to identify initial concepts and coded systematically (e.g., codes for “adaptation”, "improvised technology", "payment barrier", "community trust").
2. Theme Development: Codes were clustered into overarching analytical themes that addressed the research objectives, such as "Forms of Resilience", "Systemic Barriers", and "The ISP-MSME Symbiosis".
3. Case Story Crafting: The most compelling and illustrative narratives were selected from the coded data. These were developed into 7 standalone case stories, each structured to highlight a central protagonist, a defining challenge, their adaptive response, and ongoing tensions.

3.5 Ethical Considerations

The research adhered to the core humanitarian principle. Given the informal and at times legally ambiguous nature of the subject matter, stringent ethical protocols were implemented:

- Verbal Informed Consent: Prior to each interview, the study's purpose, voluntary nature, and confidentiality measures were explained, and verbal consent was audio-recorded.
- Anonymity and Confidentiality: All potentially identifying information (names, specific addresses, unique operational details) was removed or pseudonymized in transcripts and the final report to protect participants from legal or security risks.
- Secure Data Management: All digital data was stored on password-protected devices, with access limited to the research team.

3.6 Limitations of the Study

This study provides valuable qualitative insights into the role of informal ISPs and digital adaptation in Gaza during the crisis. However, the following methodological and contextual parameters should be considered when interpreting the findings:

- Insights were gathered primarily through interviews, which depend on participants' feedback and experience. While this method yields depth, it may not fully capture technical or quantitative aspects of connectivity performance or economic impact.
- Due to the qualitative nature of the study, detailed financial data, particularly on connectivity costs, operators' revenues, and MSMEs transaction volumes, was not systematically collected. This limits the ability to conduct economic analysis or cost-benefit assessments of informal ISP models.

4. Main Findings

The collapse of Gaza's formal telecommunications infrastructure created a vacuum that was filled not by a monolithic alternative, but by a diverse, adaptive, and resilient network of informal ISPs. This ecosystem, comprising individual entrepreneurs, small cooperatives, and structured reseller networks, became the operational backbone of Gaza's digital economy during the crisis. Their models, though born of necessity, evolved into sophisticated systems of service delivery, coordination, and community support.

These findings are synthesized from the seven case stories presented in the following section. As evidenced across the cases, the analysis below highlights recurring operational models, shared challenges, and adaptive strategies that characterize the informal ISPs ecosystem and its role in sustaining digital economic activity in Gaza.

4.1 Operational Models: From Survival Business to De Facto Governance

Informal ISPs operated across a spectrum of organizational complexity. At one end were micro-scale survival businesses, like Khalil and Hisham (Case 3), who rebuilt networks from tents in displacement camps using "salvaged and donated equipment" and barter transactions. These micro-operators provided hyper-local connectivity, often accepting payment in e-wallets, food items, or fuel, demonstrating extreme flexibility.

A more structured model is exemplified by the mid-sized neighborhood ISP in Case 1. Starting as a small provider for 80-100 households, it rapidly scaled to serve over 400 users, applying "unified access rules" and "bandwidth rationing" to manage crisis demand. This operator evolved from a simple service provider into a local digital backbone, coordinating with peers to share equipment and balance bandwidth through informal "peer-to-peer arrangements".

The most advanced model emerged from reseller-based networks like New StarMax (Case 2). These entities established "de facto governance systems, "introducing" unified pricing ranges, basic bandwidth allocation rules, and shared troubleshooting practices" for their downstream resellers. This informal coordination, driven by the need for market stability, laid the groundwork for formal integration, as seen when Paltel's *Almubadra* initiative "institutionalized and scaled coordination with reseller networks". This evolution from informal coordination to a hybrid formal-informal model highlights the sector's inherent capacity for self-organization and stability.

4.2 Technologies and Infrastructure: Improvisation and Resilience

The technological foundation of the informal ecosystem was defined by improvisation and resilience, not high-end hardware. Networks were typically built from:

- Used and Repurposed Equipment: Routers, cables, and antennas recovered from damaged homes, as seen in Case 3.
- Improvised Power Solutions: Small solar panels, community-shared batteries, and power inverters were critical, given the near-total absence of grid electricity.
- Low-Cost, Off-the-Shelf Gear: Basic rooftop antennas and reused routers formed the core of last-mile distribution.
- Human-Centric Troubleshooting: As one operator noted, service continuity depended on "fast, practical adjustments rather than formalized planning" (Case1).

This approach created a distributed and decentralized infrastructure that proved more agile and less vulnerable to single-point failures compared to a centralized formal grid. The technology was "minimal but operational," prioritizing basic functionality over sophistication.

4.3 Service Areas and Economic Role: The Critical Digital Lifeline

Informal ISPs primarily served last-mile and community-centric coverage, filling gaps where formal networks were destroyed or unreachable. Their service areas included:

- Densely populated neighborhoods and displacement camps (Cases 1, 3, 4).
- Shelters and host communities, enabling hyper-local digital markets.
- Areas around critical access points where freelancers formed "connectivity clusters" (Case 5).

Their role transcended mere connectivity. They became essential enablers of the entire digital economy: MSMEs relied on them to receive orders and process digital payments; freelancers used them to maintain international work; households depended on them for communication and accessing humanitarian aid. As further elaborated later in the Cross-Cutting Themes section, they enabled "high-value economic activity" with low-bandwidth solutions, proving that even minimal, intermittent connectivity could sustain crucial financial and social flows.

4.4 Operational Challenges: A Landscape of Constant Constraint

Despite their resilience, informal ISPs operated under severe, interconnected constraints:

- Technical and Logistical: "Limited equipment, spare parts, and backup power restrict network reliability" (Case 1). Operators faced "voltage issues, damaged equipment, and unstable upstream supply" (Case 2).
- Financial and Market: Revenues were "unpredictable due to cash scarcity and non-cash payments" (Case 3). Liquidity shortages affected the ability to procure fuel and parts.
- Regulatory and Legal: Operating "without licenses" created persistent "legal and operational risks" and left operators without formal protection or support channels (Case 2).
- Physical Security and Instability: Operating from "temporary shelters" made it impossible to maintain standard technical safety, installation protocols, and exposure to hacking (Case 3).

4.5 An Ecosystem Defined by Adaptive Resilience

The informal ISP ecosystem that emerged in Gaza is not merely a temporary aberration but a testament to adaptive resilience. It is characterized by flexible, community-embedded models, improvisational technology, and a critical role in sustaining economic and social life. The challenges they face are systemic, pointing to the need for recognition and integration. As the case of *Almubadra* demonstrates, the future of Gaza's digital resilience likely lies in hybrid models that formally leverage the agility and coverage of these informal networks while providing them with the technical, regulatory, and financial stability.

5. Case Stories

5.1 CASE 1 — The Emergency Backbone "When Informal Became Key Infrastructure" Pre-Crisis Operations and Market Position

When Gaza's formal telecommunications network collapsed during the 2023–2025 crisis, connectivity in many areas dropped to near zero. Mobile towers were destroyed, fiber routes were cut, and major ISPs were unable to restore service for extended periods. During this period, several informal providers emerged as the only functioning sources of internet access. One of the most significant examples is a mid-sized neighborhood ISP in the southern region, which transformed from a local service provider into the primary operational backbone for thousands of displaced residents and MSMEs.

Before the crisis, the operator managed a small informal network serving approximately 80–100 households. His infrastructure consisted of basic rooftop antennas, reused routers, and a single upstream line purchased informally from a licensed provider. The business model was simple: low-cost monthly subscriptions, direct customer relationships, and basic technical support. While the operation was unlicensed and not integrated into formal regulatory frameworks, it maintained stable service in its immediate coverage area and filled market gaps left by formal providers.

Rapid Scalability Under Systemic Collapse

The situation changed abruptly once the formal infrastructure went offline. According to operator records and field interviews, active users on the network surged to more than 400 within days, driven by the collapse of all formal ISPs in the surrounding area. The small-scale system was not designed to manage such demand, and equipment losses made the challenge even more difficult. Despite lacking spare parts, fuel, or technical support, the operator-maintained service availability by repairing damaged devices, reallocating bandwidth across users, and employing improvised power solutions, including small solar panels and community-provided batteries.

Service continuity depended on fast, practical adjustments rather than formalized planning. The operator applied unified access rules to prevent system overload, kept pricing stable to ensure affordability, and managed bandwidth rationing to align with available capacity. These decisions were shaped by immediate operational needs, particularly the requirements of MSMEs that relied on connectivity for essential activities such as receiving orders, coordinating deliveries, and processing mobile-wallet transactions. Even limited connectivity played a significant role in enabling basic digital functions for small shops, home-based producers, and freelance workers.

Formation of an Informal Technical Backbone

As formal networks remained offline, the informal ISP gradually assumed the role of a local digital backbone. To stabilize upstream supply, the operator coordinated with nearby informal providers through peer-to-peer arrangements involving shared equipment, mutual troubleshooting, and bandwidth balancing. While these collaborations lacked formal agreements or regulatory oversight, they generated a mutually supportive ecosystem that maintained essential connectivity for densely populated areas and displacement shelters.

The operational model displayed characteristics typically associated with formal service delivery: coordinated resource management, standardized service rules, and consistent technical protocols. Although informal, the network's performance demonstrated that decentralized systems can maintain functionality under extreme conditions when large-scale infrastructure fails.

This case highlights the operational capacity of informal ISPs to scale rapidly during emergencies, sustain essential digital services for MSMEs, and function as critical infrastructure despite minimal

resources. The experience illustrates the importance of recognizing informal providers within broader digital resilience strategies. Integrating such actors into recovery planning, whether through equipment support, simplified licensing pathways, or coordinated emergency protocols, could strengthen Gaza's ability to maintain connectivity in future crisis and instability scenarios.

Key Insights

The insights below are specific to this case and are later synthesized with other cases in the cross-cutting themes section.

Opportunities

- Informal ISPs can rapidly expand coverage when formal systems collapse.
- Community-based networks provide flexible, relatively low-cost connectivity based on the available internet speed for MSMEs and households compared with the Israeli or Egyptian networks.
- Distributed infrastructure models reduce dependency on centralized telecom assets.
- Informal operators can support essential digital functions (orders, payments, and communication).

Challenges

- Limited equipment, spare parts, and backup power restrict network reliability.
- No formal regulation or technical standards for bandwidth management.
- High congestion and limited upstream capacity during emergency scaling.
- Operators lack legal protection and access to formal support channels.

Resilience Lessons

- Community-driven models can stabilize connectivity when formal systems fail.
- Small informal ISPs are strategically positioned to act as emergency backbones.
- Decentralized systems provide agility and faster recovery than centralized networks.
- Supporting informal providers strengthens overall digital resilience in crisis settings.

5.2 CASE 2 — The Community Regulator "From Informal Coordination to a Formal Initiative: The Case of New StarMax and Paltel"

Early Market Disruption and the Need for Order

Following the collapse of Gaza's telecommunications infrastructure, the internet market entered a phase of severe instability. Fixed networks were largely offline, mobile coverage was limited, and demand for connectivity surged sharply. In this environment, hundreds of small neighborhood resellers and informal networks emerged or expanded rapidly. While these networks provided essential access, the absence of coordination created risks: inconsistent pricing, uneven service quality, upstream bottlenecks, and growing customer disputes.

New StarMax, an established informal ISP operating before the war, was positioned at the center of this disruption. Unlike ad-hoc street networks, New StarMax already functioned as a structured reseller-based operation with technical systems, customer data, and experience managing upstream capacity. As demand escalated, the company recognized that unmanaged expansion would undermine both service continuity and market trust.

In response, New StarMax initiated a set of informal coordination measures aimed at stabilizing its reseller ecosystem. These measures were not regulatory in nature, but operational. They focused on maintaining minimum service quality, preventing extreme price fluctuations, and reducing customer

complaints. Resellers were encouraged to follow unified pricing ranges, apply basic bandwidth allocation rules, and adhere to shared troubleshooting practices. Compliance was voluntary but widely adopted, as it reduced operational friction and protected resellers' reputations during a highly sensitive period.

This early coordination marked a shift in how informal ISPs functioned. New StarMax moved beyond being a bandwidth supplier and began acting as a market coordinator, mediating between upstream constraints and downstream demand.

New StarMax as a De Facto Governance Hub

As formal ISPs remained largely incapacitated, New StarMax increasingly assumed a governance role within its network. The company centralized technical decision-making, guided antenna placement and alignment, advised on equipment reuse and repair, and managed upstream congestion through shared allocation mechanisms. Data collected from reseller activity was used to monitor usage patterns and prevent overloading of critical links.

This coordination was driven by necessity rather than authority. Without legal enforcement mechanisms, New StarMax relied on trust, mutual dependence, and shared risk. Resellers accepted guidance because access to upstream capacity depended on cooperation, and because stability benefited all actors involved.

Importantly, New StarMax did not operate in isolation. Its approach demonstrated that informal networks could self-organize around **functional rules**, even in the absence of a regulator. However, the model also faced clear limits. The lack of formal recognition constrained scalability, and upstream supply remained fragile, dependent on a shrinking number of operational routes.

Paltel's Entry and the Launch of Almubadra

As the crisis prolonged, Paltel—the largest licensed ISP in Palestine—recognized that a significant portion of Gaza's population was now dependent on informal networks. At the same time, unregulated expansion posed risks: customer exploitation, technical interference, and long-term damage to the telecom ecosystem. Rather than attempting to dismantle these networks, Paltel opted for structured engagement.

Paltel launched the Almubadra Initiative, a formal program designed to organize and stabilize last-mile connectivity during the emergency. Under Almubadra, Paltel offered free or low-cost upstream internet to local networks under specific conditions. These included adherence to a unified price ceiling, minimum service quality standards, and centralized technical management of bandwidth.

Unlike earlier informal arrangements, Almubadra introduced formal reseller agreements, standardized revenue-sharing models, and defined operating rules. Paltel retained responsibility for regulatory compliance, taxes, and upstream infrastructure, while resellers focused on last-mile distribution. This model reflected Paltel's recognition that local networks were more flexible and mobile than centralized infrastructure, particularly in displacement zones.

Shared Governance and Market Stabilization

The *Almubadra* framework expanded the reach of these practices beyond New StarMax's network, creating a wider ecosystem of coordinated informal ISPs. This hybrid model, informal first-mover innovation supported by formal sector scaling, resulted in more predictable service availability during a period of prolonged infrastructure failure. It also established a clearer operational interface between unlicensed resellers and Palestine's main telecom provider, something that had rarely existed before the crisis.

This case demonstrates that the informal ISP sector in Gaza does not operate in isolation. The emergency-driven governance initiated by New StarMax provided the foundation for a more formalized support mechanism when Paltel launched *Almubadra*. Together, the two actors created a scalable, practical system for stabilizing last-mile connectivity, reducing customer disputes, and maintaining service reliability during unprecedented disruption.

As Gaza enters a reconstruction phase, the collaboration between informal ISPs and Paltel highlights a viable pathway for integrating informal ISPs into national connectivity strategies. The case shows how bottom-up innovation, when combined with top-down institutional support, can create resilient operational networks capable of sustaining digital access under extreme conditions.

Key Insights

The insights below are specific to this case and are later synthesized with other cases in the cross-cutting themes section.

Opportunities

- Informal ISP networks can establish basic governance systems even without formal regulation.
- Paltel's Almubadra initiative offers potential for scalable, structured integration with informal resellers.
- Unified pricing and shared technical standards improve market stability.
- Collaboration between formal and informal actors creates hybrid models suited for crisis conditions.

Challenges

- Informal resellers operate without licenses, creating legal and operational risks.
- Voltage instability
- Damaged equipment, and unstable upstream supply strain the system.
- Dispute resolution mechanisms are informal and depend on voluntary compliance.
- Market fragmentation can re-emerge without continuous coordination.

Resilience Lessons

- Bottom-up coordination can evolve into functional governance in high-stress environments.
- Formal sector engagement (Paltel) can scale and institutionalize informal innovations.
- Shared backend systems and standard operating procedures reduce system failures.
- Hybrid formal–informal models offer a realistic pathway for telecom recovery.

5.3 CASE 3 — The Displaced Engineer "Rebuilding a Network from a Tent: Khalil and Hisham's Operational Model"

Operational Disruption and Complete Asset Loss

The destruction of telecom infrastructure during the war resulted in the loss of equipment, towers, and operating sites for many informal ISPs. Two operators—Khalil and Hisham—represent a category of small-scale providers who lost their entire technical assets and were forced to rebuild from displacement sites. Their experience highlights a practical form of survival entrepreneurship: the restoration of last-mile connectivity using salvaged equipment, improvised power systems, and micro-scale business adjustments.

Before the crisis, both operators managed modest neighborhood networks. Their systems consisted of home routers, mid-range antennas, and basic power backups. They supplied connectivity to households, freelancers, and small businesses that relied on Wi-Fi for digital payments, online orders, and remote work. This model generated stable but limited income and positioned them as essential local service providers.

The war rendered this infrastructure unusable. Both operators lost routers, switches, cables, poles, and backup batteries. Their service areas were depopulated or destroyed, and their physical facilities became inaccessible. Despite these losses, connectivity demand surged in displacement camps where families and MSMEs required even minimal bandwidth for communication, coordination of aid flows, and digital payments.

Rebuilding Connectivity Under Extreme Constraints

Khalil reconstructed a basic network using an improvised collection of salvaged and donated equipment. Community members retrieved old routers and partial cabling from damaged homes, which he reassembled into a functional system. He acquired additional components through barter transactions, exchanging small technical services and personal labor for antennas, chargers, and used routers. Although the equipment was mismatched and often degraded, it allowed him to establish a limited but operational hotspot in the shelter.

Hisham followed a similar path. After relocating to a tented settlement, he installed a minimal network using one long-range antenna, a small solar panel, and a repurposed power inverter. With no access to professional tools, he built a wooden stand to mount the antenna and used plastic sheeting to protect the components. His power supply was inconsistent, but it enabled periodic service windows that residents depended on for essential communication.

Both operators practiced micro-scale bandwidth management. Given limited upstream capacity, they rationed bandwidth across users, prioritized basic communication traffic, and limited high-volume usage during peak hours. These operational decisions allowed the networks to remain functional despite severe constraints.

Service Provision, Payment Flexibility, and Economic Value

The reconstructed networks supported a range of essential digital activities. Some women-led home businesses used the connection to receive orders and process banking transfers. Freelancers depended on the network to communicate with international clients. Small traders used WhatsApp to announce product availability. For many households, these micro-activities were the only available source of income during displacement.

Because liquidity was scarce, both operators adapted their revenue models. Customers paid using e-wallet transfers, food items, or small fuel contributions. Although these arrangements did not fully replace pre-war revenue, they allowed the operators to cover minimal operating costs and maintain equipment functionality. Over time, the networks stabilized into predictable micro-enterprises with small, regular user bases.

Despite operating from temporary shelters, both Khalil and Hisham became the primary connectivity providers for their respective camp communities. Their networks, while limited in speed and reliability, enabled essential communication and supported the continuation of micro-economic activity. The operational decisions they made—equipment reuse, barter-based procurement, bandwidth rationing, and flexible payments—collectively formed a viable resilience model during a period of infrastructure failure.

This case demonstrates that informal ISPs can restore essential digital access even after complete asset loss when supported by community contributions and flexible business practices. For policymakers and digital economy stakeholders, it highlights the importance of including small operators in resilience planning. Basic equipment support, simplified licensing pathways, and technical training could significantly improve their capacity to deliver last-mile connectivity during future crises.

Key Insights

The insights below are specific to this case and are later synthesized with other cases in the cross-cutting themes section.

Opportunities

- Informal ISPs can reconstruct services with minimal resources through community support.
- Barter-based procurement enables continued operations despite cash shortages.
- Displacement sites create concentrated demand, enabling rapid customer base re-establishment.
- Improvised networks provide critical connectivity for MSMEs, freelancers, and households.

Challenges

- Complete asset loss forces operators to rely on inconsistent, salvaged equipment.
- Power instability severely limits service quality.
- Revenues are unpredictable due to cash scarcity and non-cash payments.
- Technical safety and installation standards cannot be maintained in temporary shelters.

Resilience Lessons

- Micro-scale, low-cost telecom models can survive extreme shocks with flexible operations.
- Community contributions (equipment, batteries, labor) are essential resilience engines.
- Bandwidth rationing and adaptive business models sustain functionality under constraints.
- Supporting small operators accelerates connectivity recovery at the community level.

5.4 CASE 4 — The Women's Marketplace "From Tent Kitchen to Digital Commerce: Women-Led Micro-Enterprises Using Informal Connectivity"

Operational Disruption and Market Shift

The disruption of formal commerce in Gaza forced many micro-enterprises to shift toward highly localized, digitally enabled sales channels. Among them, women-led home businesses demonstrated notable adaptability, using informal internet access and basic digital tools to sustain income during prolonged displacement. This case examines the experience of two micro-enterprises—represented by Rasha and the Balaha and Zaitona team—to illustrate how small producers leveraged WhatsApp communication, Facebook visibility, and PalPay QR payments to maintain commercial activity under severe constraints.

Before the crisis, both enterprises operated within established market routines. Rasha managed a home-based production line selling prepared food and handmade items, while Balaha and Zaitona specialized in packaged food products distributed through retail shops and online marketing. Their operations relied on predictable supply chains, face-to-face customer interactions, and, in the case of Balaha and Zaitona, structured digital marketing campaigns run through private-sector agencies such as Creativity Company.

The collapse of physical retail, transportation routes, and formal digital infrastructure disrupted every aspect of their work. However, demand for small-scale, locally available goods remained strong within displacement shelters and host communities. To respond, both enterprises shifted their operational model from formal distribution to community-centered, digitally supported sales.

Digital Adaptation Under Informal Connectivity

Connectivity was the first barrier. Neither enterprise could rely on formal ISPs, and access to mobile networks was extremely limited. Instead, they depended on local informal providers whose networks reached displacement sites. The connection quality was inconsistent, but it allowed basic digital communication—primarily through WhatsApp messaging and Facebook posts. These channels became the core interface for both marketing and order management.

Rasha's business model adapted first. Working from a temporary shelter, she reorganized her production to match locally available ingredients. Instead of selling a wide catalog of items, she focused on a small set of high-demand products. Orders were received through WhatsApp, and customers shared her contact information through personal networks. Payments were processed using PalPay QR codes whenever cash was unavailable. While transaction volume was significantly lower than before the crisis, the digital workflow allowed her to maintain some financial stability and remain economically active.

Balaha and Zaitona experienced a different transition. Their pre-war sales strategy relied heavily on digital marketing, e-commerce catalogues, and partnerships with delivery companies. With these systems disrupted, the enterprise shifted toward direct-to-community sales through Facebook announcements and WhatsApp groups. The informal ISP signal allowed them to post product updates, coordinate small distribution rounds, and accept e-wallet payments. Although their overall reach decreased, their ability to maintain visibility online prevented a complete operational breakdown.

Across both enterprises, digital payments played an essential role. Cash scarcity was widespread, and the destruction of ATMs and banking facilities made e-wallets the most reliable method for small transactions. PalPay's infrastructure remained functional during much of the crisis, enabling micro-enterprises to process payments quickly and securely. For women managing production from temporary shelters, digital payments reduced the need for physical movement and helped maintain transaction records when traditional bookkeeping was impractical.

These adaptations generated meaningful outcomes: they preserved minimal revenue flows, maintained customer relationships, and reinforced the role of women-led enterprises in the local digital economy during crisis conditions. The case demonstrates that micro-enterprises can sustain commercial activity even when infrastructure collapses, as long as basic informal connectivity and digital payment tools remain accessible.

As Gaza enters a recovery phase, this case highlights the need to embed women-led micro-enterprises in digital market systems through reliable connectivity, simplified financial tools, and tailored support programs. The experiences of Rasha, and Balaha and Zaitona demonstrate that even under extreme constraints, women entrepreneurs continue to play a critical role in local economic resilience.

Key Insights

The insights below are specific to this case and are later synthesized with other cases in the cross-cutting themes section.

Opportunities

- Simple digital tools (WhatsApp, Facebook, QR payments) enable MSME continuity.
- Informal connectivity offers women-led enterprises access to local and hyper-local markets.
- Digital payments reduce dependency on physical mobility and cash.
- Micro-enterprises adapt product lines quickly based on available inputs.

Challenges

- Connectivity quality is inconsistent, limiting marketing reach.
- Supply chain disruptions reduce product diversity and production capacity.
- Liquidity constraints affect the purchasing of raw materials.
- Safety risks and displacement reduce operational stability.

Resilience Lessons

- Digital commerce does not require advanced platforms; minimal connectivity is sufficient.
- Women entrepreneurs can pivot rapidly when supported by basic digital infrastructure.
- Digital payments are critical for micro-business survival under cash scarcity.
- Localized, low-tech digital models provide continuity even when formal markets collapse.

5.5 CASE 5 — The Freelancer Cluster
"Working Worldwide Through Neighborhood Wi-Fi"

Remote Work Continuity Under Infrastructure Collapse

Before the crisis, Gaza's freelance workforce, largely of young, highly skilled professionals in fields such as graphic design, software development, translation, digital marketing, and virtual support, was deeply reliant on consistent reliable internet connectivity. This segment of the labor market functioned as an integral part of the global digital economy, with freelancers providing services to clients across the Gulf region, Europe, and North America. Engagements were commonly facilitated through international online platforms, including Upwork and Fiverr, as well as through direct contractual arrangements with overseas firms and individual clients. For many, freelance work represented not only a primary source of income but also an opportunity for professional development and cross-border integration to overcome a constrained local labor market. When the formal telecommunications system collapsed, remote work activity dropped sharply. However, a subset of freelancers reorganized themselves around the limited connectivity provided by informal ISPs and community hubs, forming small clusters in displacement sites and damaged neighborhoods.

These clusters were not formal groups, but rather practical arrangements built around shared access points. Freelancers identified locations where informal ISPs had managed to restore partial service, often through rooftop antennas or solar-powered routers. They coordinated working hours to reduce congestion, shared device-charging capacity, and maintained communication channels with clients using minimal bandwidth tools such as WhatsApp voice notes, low-resolution file transfers, and lightweight project-management platforms.

The role of informal ISPs was central. These providers enabled basic connectivity in areas where no formal service was available. Despite technical limitations, the networks supplied enough bandwidth for essential work tasks—sending drafts, downloading briefs, or maintaining client communication. This level of connectivity prevented a complete disconnect from global labor markets, allowing freelancers to maintain partial or full income during prolonged service outages.

Digital Payments and International Contract Stability

Freelancers also relied heavily on digital payment systems to sustain their income. With traditional banking services offline and cash availability limited, e-wallets—particularly PalPay—became the primary channel for receiving local transfers from intermediaries or family members abroad. Some freelancers used regional payment networks through Jordanian, Egyptian, or Gulf-based contacts who acted as payment brokers. These brokers transferred funds to Gaza via mobile money, which freelancers then accessed through local agents operating within displacement sites.

While these methods created additional transaction fees and delays, they allowed freelancers to continue participating in cross-border digital labor markets. In many cases, earning even a fraction of their pre-war income positioned freelancers as key financial supporters of their extended families. This economic role increased the importance of sustaining minimal connectivity, as freelancers often became primary income generators within their shelter communities.

Operational Adaptation and Local Economic Impact

To adjust to the restricted digital environment, freelancers shifted to smaller-task contracts that required less bandwidth and fewer file transfers. Graphic designers focused on logo revisions instead of full advertising packages. Writers concentrated on short-form content. Programmers prioritized code debugging rather than full platform development. These work adjustments aligned with the limited connectivity available through informal ISPs.

Freelancer clusters also developed informal knowledge-sharing routines. More technically skilled individuals supported others in optimizing device settings, compressing files, and troubleshooting connectivity issues. These collaborative practices reduced the operational burden on informal ISPs, who were often overwhelmed with requests and lacked spare equipment.

The economic impact of these clusters extended beyond individual earnings. Freelancer income circulated within shelters and host communities, supporting micro-purchases of food, hygiene items, and basic supplies. The presence of even limited freelance activity thus contributed to local economic stability at a time when traditional MSMEs faced persistent supply disruptions.

This case demonstrates how Gaza's freelance workforce adapted to extreme infrastructure collapse by reorganizing around informal ISPs and adopting low-bandwidth workflows. Their ability to remain engaged in international labor markets highlights the strategic importance of connectivity—not only for communication but also for income continuity and household resilience. Supporting this segment of Gaza's digital workforce in future recovery efforts—through equipment provision, training, and improved digital payment channels—could strengthen the broader digital economy and reduce vulnerability during future disruptions.

Key Insights

The insights below are specific to this case and are later synthesized with other cases in the cross-cutting themes section.

Opportunities

- Freelancers maintain access to international labor markets despite infrastructure collapse.
- Clusters facilitate shared knowledge, shared devices, and efficiency in limited connectivity.
- Low-bandwidth tools enable partial continuation of remote work.
- Digital payments and intermediaries support income continuity.

Challenges

- Limited bandwidth restricts the type and size of freelance projects.
- Payment channels are unstable, slow, or dependent on brokers.
- Device-charging constraints and power shortages disrupt workflow.
- Security and displacement reduce the ability to work consistently.

Resilience Lessons

- Young freelancers demonstrate high adaptability in reorganizing workflows.
- Minimal connectivity is sufficient to maintain essential professional relationships.
- Income from freelancers stabilizes local micro-economies in shelters.
- Investing in low-tech remote work infrastructure boosts resilience during crises.

5.6 CASE 6 — MSMEs Digital Shift
"The Shop That Became a Digital Storefront"

Market Disruption and Loss of Physical Infrastructure

The destruction of commercial areas in Gaza severely disrupted small and micro retail businesses. Many MSMEs—particularly grocery shops, household goods stores, and small clothing retailers—lost their premises, storage rooms, and physical customer access points. Despite these losses, demand for essential goods persisted inside displacement camps and host communities. This created a fragmented but active market in which physical operations were no longer feasible, but minimal digital connectivity could still enable trade.

One representative case is a neighborhood convenience shop that previously relied on foot traffic and local reputation. The store was damaged early in the conflict, and the owner lost inventory, shelving, and refrigeration equipment. With no physical point of sale, the business faced an immediate risk of

permanent closure. However, the owner reorganized the enterprise around digital communication and informal distribution networks, effectively converting the destroyed shop into a small-scale digital storefront.

Transition to Digital Visibility and Community Logistics

The business model shifted from physical display and in-person service to remote ordering facilitated through simple digital tools. Using an informal ISP connection available in the area, the shop owner created a basic sales workflow centered on Facebook posts, WhatsApp broadcasts, and photo-based product catalogues. Because the internet signal was unstable, the catalogues were not presented as full e-commerce listings but as low-resolution images shared with customers upon request.

Customers in shelters and neighbouring households used these channels to check product availability, place orders, and coordinate delivery times. The owner sourced goods from functioning wholesalers or from peers who still had partial inventory, then organized community-based transportation—often relying on neighbours, relatives, or volunteer delivery runners. This informal logistics system replaced formal delivery services, which remained offline during most of the crisis.

Pricing was communicated digitally, and the owner adjusted inventory in real time based on market constraints. Although profit margins were reduced due to supply shortages and higher transportation costs, the digital-to-local workflow allowed the business to maintain operations and provide essential goods to customers with limited mobility.

Adoption of Cashless and Low-Contact Payments

The integration of e-payment systems played a significant role in the enterprise's continuity. With cash circulation highly restricted and ATM access nearly impossible, customers increasingly relied on digital wallets. The shop owner accepted PalPay transfers for small purchases, enabling transactions to proceed without physical cash. This system reduced the risk of liquidity shortages and supported transparent transaction tracking during a period of financial instability.

Some customers also used mixed payment methods—part cash, part e-wallet transfer—based on availability. These flexible arrangements allowed the business to maintain a steady flow of microtransactions, which sustained working capital despite disrupted supply chains.

Economic and Operational Outcomes

While overall sales volume remained below pre-crisis levels, the digital shift enabled the MSME to sustain revenue, maintain customer relationships, and remain active in the local economy. The business provided an essential service by aggregating fragmented supply sources and delivering goods to households that lacked the ability to move across dangerous or inaccessible areas.

The experience illustrates how even the smallest enterprises can adopt low-tech digital tools to preserve functionality. The case confirms that digital commerce in crisis settings does not require advanced platforms; instead, it relies on basic connectivity, flexible logistics, and the ability to communicate product availability effectively.

For policymakers and support organizations, this case highlights the importance of reinforcing MSME digital capacities—even at the simplest operational level. Providing stable connectivity, access to digital payment tools, and basic training on digital communication can significantly expand the economic resilience of small businesses during infrastructure disruptions.

Key Insights

The insights below are specific to this case and are later synthesized with other cases in the cross-cutting themes section.

Opportunities

- MSMEs can operate without physical storefronts through basic digital communication.
- Informal ISPs provide enough bandwidth for catalogue sharing and order management.
- Digital payments reduce reliance on damaged banking infrastructure.
- Community-based delivery systems replace formal logistics.

Challenges

- Supply chain fragmentation reduces product availability.
- Informal delivery networks create cost and reliability challenges.
- Digital catalogues are limited by low-quality connectivity.
- Profit margins remain narrow due to increased sourcing costs.

Resilience Lessons

- Even the smallest MSMEs can transition to digital-first operations during crises.
- Basic digital visibility (posts, photos, and messages) is sufficient to maintain trade.
- Cashless transactions improve operational continuity under liquidity stress.
- Low-tech digital commerce strengthens household-level economic stability.

5.7 CASE 7 — The Wallet Lifeline
"PalPay: Digital Finance Under Siege"

Collapse of Cash Infrastructure and Rapid Shift to Digital Wallets

The destruction of Gaza's banking infrastructure—ATMs, bank branches, cash distribution points, and armoured cash transport routes—created a severe liquidity crisis. With physical cash almost unavailable and formal financial institutions operating at minimal capacity, households and MSMEs faced significant barriers in conducting even basic transactions. During this period, digital wallets emerged as the most reliable, functional, and accessible form of financial exchange.

PalPay, one of Gaza's largest e-wallet providers, played a central role in sustaining the flow of small-scale financial activity during prolonged infrastructure failure. Before the crisis, PalPay had already achieved strong penetration in Gaza, supported by merchant adoption and broad consumer familiarity. However, usage remained mixed: many customers used the service for topping up mobile credit or making domestic transfers, but still relied heavily on cash for daily expenditures.

The collapse of cash availability changed this dynamic. With ATM networks down and physical currency scarce, PalPay became an essential payment mechanism for households, micro-enterprises, NGOs, and informal market actors.

Operational Continuity and System Flexibility During the Crisis

PalPay maintained operational continuity despite major disruptions to telecom networks and banking channels. The system's resilience was supported by several factors: locally hosted servers, multi-operator network routing, agent-based liquidity pools, and flexible Know Your Customer (KYC) policies adjusted for crisis conditions. Even under degraded connectivity, the platform continued to process transfers and merchant payments, enabling financial continuity for thousands of users.

During field interviews, multiple MSMEs described how PalPay became their primary sales channel. Women-led micro-businesses used PalPay QR codes to receive payments for food products and handmade items. Freelancers depended on the wallet to receive local transfers and remittances sent

through intermediaries. Small retailers used the platform to process low-value transactions when customers lacked cash. These payment flows were modest in size but critical for household-level financial stability.

Liquidity remained a challenge due to the limited ability of agents to cash out balances. As physical cash became increasingly scarce, many transactions shifted toward **peer-to-peer digital transfers**, creating a closed-loop digital economy within certain neighborhoods and displacement sites. While the absence of cash-out options reduced the system's flexibility, it also increased the digital retention of funds, allowing more transactions to remain within the digital ecosystem.

Integration with Informal ISPs and MSME Digital Activity

The functionality of digital wallets depended directly on the limited connectivity provided by informal ISPs. Even low-bandwidth access—sufficient for USSD commands or lightweight app usage—enabled users to check balances, transfer money, or process QR payments. Informal ISPs became indirect enablers of Gaza's digital financial infrastructure by sustaining the minimal connectivity required for mobile financial services to function.

MSMEs used PalPay to reduce reliance on physical cash, which was either unavailable or risky to hold. Shop owners accepted PalPay transfers for small purchases, freelancers used it to settle local transactions, and micro-enterprises used it to pay part-time workers. The system enhanced transparency, reduced the need for physical movement, and supported more secure financial exchanges during a volatile period.

Humanitarian actors also increasingly relied on digital wallets, with e-cash transfers delivered through PalPay becoming a viable alternative to physical distribution. This model reduced logistical risks and improved delivery speed, although it still depended on liquidity availability and the capacity of agents to manage digital-to-cash conversion.

Strategic Implications for Gaza's Financial Resilience

The case of PalPay demonstrates how digital financial systems can operate as critical infrastructure when traditional banking and cash channels collapse. The platform sustained financial flows for households, MSMEs, and informal market actors and allowed economic activity to continue at a minimal but essential level. Its operational resilience highlights several strategic considerations for policymakers and donors:

- digital wallets can function as emergency financial systems;
- integration with informal connectivity providers is crucial;
- simplified onboarding and flexible KYC can expand access during crises;
- liquidity management remains the principal constraint that limits scale.

As Gaza enters a recovery phase, strengthening digital financial infrastructure—through improved connectivity, increased agent networks, liquidity support programs, and integration with MSME payment systems—will be essential for building a more resilient, less cash-dependent economy.

Key Insights

The insights below are specific to this case and are later synthesized with other cases in the cross-cutting themes section.

Opportunities

- Digital wallets function as emergency financial infrastructure when banks fail.
- PalPay enables MSMEs, households, and freelancers to conduct low-value transactions.

- Peer-to-peer transfers create a functional digital economy inside shelters.
- E-wallets reduce dependency on unsafe physical cash circulation.

Challenges

- Liquidity shortages limit withdrawal capacity and increase reliance on digital-only funds.
- Infrastructure degradation (power, connectivity) affects wallet accessibility.
- Agent network limitations cause delays and transaction bottlenecks.
- Increased fees from intermediaries reduce net income for users.

Resilience Lessons

- Digital finance is a core resilience pillar in environments with collapsed cash systems.
- Basic connectivity from informal ISPs is critical for digital wallet functionality.
- Flexible KYC and streamlined onboarding expand user access during crises.
- Strengthening digital payments accelerates economic recovery and reduces vulnerability.

6. Cross-Cutting Themes

Insights Across Informal Connectivity, MSME Adaptation, and Digital Payments in Crisis Conditions

The seven cases highlight how Gaza's digital economy functioned during a prolonged collapse of formal telecommunications and cash infrastructure. Despite major disruptions, MSMEs, freelancers, and households continued essential digital activity through a combination of informal connectivity, improvised operational models, and adaptive use of e-payment systems. Together, the cases reveal several cross-cutting themes that define the structure of resilience in Gaza's crisis-affected digital landscape.

6.1 Informal ISPs as Critical Digital Infrastructure

When formal networks failed, informal ISPs became the operational backbone of Gaza's digital ecosystem. Their decentralized, community-embedded models proved more agile and less vulnerable to single-point failure than centralized systems. Cases 1, 2, and 3 highlight how these providers scaled rapidly, established de facto governance mechanisms, and in some instances formed hybrid partnerships with formal operators (e.g., Paltel's *Almubadra*).

This demonstrates that informal ISPs are not marginal actors but essential components of crisis-resilient connectivity.

6.2 MSMEs Transitioning to Low-Tech Digital Commerce

MSMEs across Gaza shifted from physical operations to digital-first models using simple, accessible tools. Rather than advanced e-commerce platforms, businesses relied on WhatsApp, Facebook, and photo-based catalogues for customer communication, order management, and payment coordination. Cases 4 and 6 illustrate how women-led micro-enterprises and small retailers maintained commercial activity through hyper-local digital visibility and community logistics.

This reflects a broader transformation: MSMEs redefined "digital commerce" not as e-commerce platforms but as simple, functional digital communication replacing physical market access.

6.3 Digital Payments as a Substitute for Collapsed Cash Systems

The widespread failure of cash infrastructure accelerated reliance on digital wallets, particularly PalPay. Across Cases 4, 5, 6, and 7, e-wallets enabled households, MSMEs, and freelancers to conduct transactions when banks and ATMs were offline. Even with liquidity constraints, digital transfers created functional closed-loop economies within shelters and neighborhoods.

The shift from physical cash to digital wallets became one of the most critical enabling factors as emergency financial infrastructure for economic continuity.

6.4 Community-Based Market Systems and Informal Coordination

A recurring pattern across cases is the reliance on community networks for operational stability. Informal ISPs shared equipment and bandwidth (Cases 1–3), freelancers formed work clusters (Case 5), and MSMEs organized community delivery systems (Case 6).

These informal coordination mechanisms substituted for formal market structures, enabled resource mobilization, knowledge sharing, collective problem-solving, and created functional micro-economies during disruption.

6.5 Improvisation as a Core Operational Competency

Across all cases, actors demonstrated the ability to improvise technical, financial, and operational solutions under extreme constraints. Resilience in Gaza's digital ecosystem was driven by improvisation rather than advanced technology. Operators rebuilt networks with salvaged equipment (Case 3), MSMEs adapted business models to match available inputs (Case 4), and freelancers redesigned workflows for low-bandwidth environments (Case 5).

This capacity to innovate under constraint emerged as a defining characteristic of crisis adaptation.

6.6 Low-Bandwidth Digital Ecosystems Enabling High-Value Economic Activity

Even minimal connectivity, often intermittent and low quality, enabled important economic functions. Freelancers maintained international contracts (Case 5), MSMEs processed orders and payments (Cases 4 & 6), and households accessed humanitarian assistance (Case 7).

This demonstrates that digital resilience in crisis does not require high-speed internet, but rather stable, accessible connectivity that enables essential functions.

7. Recommendations & Policy Implications

The findings from the seven cases highlight that Gaza's digital resilience depends on a hybrid ecosystem of informal ISPs, MSMEs, freelancers, and digital payment channels operating alongside formal telecommunications and financial actors. To strengthen this ecosystem during recovery and future crises, policymakers, development partners, and private-sector stakeholders should consider the following recommendations and implications.

1. Integrate Informal ISPs into National Telecom Planning

Policy Implications:
Informal ISPs proved to be essential last-mile providers during infrastructure collapse. Excluding them from national recovery plans would leave critical gaps in resilience and service continuity.

Recommendations:
- Develop a lightweight licensing or registration framework for informal ISPs, allowing them to operate legally during emergencies.
- Create a support program for small ISPs, including access to spare parts, backup power systems, and basic training.
- Encourage formal ISPs (e.g., Paltel) to expand partnership programs such as Almubadra, institutionalizing collaboration with reseller networks.
- Include informal ISPs in emergency preparedness planning and connectivity recovery scenarios.

2. Support Low-Tech Digital Commerce for MSMEs

Policy Implications:
MSMEs relied heavily on simple digital tools—WhatsApp, Facebook, image-based catalogues—rather than complex platforms. Strengthening these low-tech capabilities will yield high returns in crisis and non-crisis periods alike.

Recommendations:
- Provide MSMEs with training on low-tech digital selling, content creation, and customer communication.
- Subsidize or support basic digital equipment (smartphones, routers, small power banks) for micro-entrepreneurs.
- Promote low-cost community logistics models that connect MSMEs with local couriers.
- Encourage public–private partnerships to expand digital marketplace hubs within community centers or incubators.

3. Strengthen Digital Payment Infrastructure and Liquidity Systems

Policy Implications:
Digital wallets served as emergency financial channels, but liquidity shortages and cash-out bottlenecks limited scale and usability.

Recommendations:
- Expand digital wallet agent networks and support liquidity pooling mechanisms during emergencies.
- Simplify KYC requirements during crises to ensure rapid onboarding for households and MSMEs.
- Promote integration of e-wallet systems with MSME operations, including QR-based payments, micro-invoices, and merchant dashboards.

- Design financial inclusion programs targeting women-led micro-enterprises and small retailers.

4. Enhance Remote Work Resilience for Freelancers

Policy Implications:
Freelancers maintained international economic linkages despite minimal connectivity. Strengthening this segment supports income diversification and local economic stability.

Recommendations:
- Establish low-bandwidth co-working hubs powered by solar energy in displacement-prone areas.
- Provide freelancers with micro-grants for devices, software licenses, and connectivity fees.
- Develop programs focused on digital skills upgrading, remote work readiness, and international market access.
- Collaborate with global platforms (e.g., Upwork, Fiverr) to facilitate fee waivers or service adjustments for Gaza-based users.

5. Formal–Informal Hybrid Models Should Guide System Redesign

Policy Implications:
Crisis-driven hybrid models (e.g., New StarMax and Paltel's *Almubadra*, informal ISPs supporting PalPay transactions) reveal a practical, scalable pathway for system reform. However, recent experience also underscores the fragility of such arrangements in the absence of clear, fair, and predictable partnership frameworks. Without structured agreements, informal providers remain vulnerable to shifting commercial policies, regulatory ambiguities, and inequitable terms, which can destabilize the resilience these models aim to create.

Recommendations:
- Design inclusive policy frameworks that formally recognize and integrate informal actors rather than leaving partnerships to ad-hoc arrangements.
- Encourage formal ISPs and payment providers to co-develop emergency operating protocols with informal networks, ensuring clarity on roles, pricing, and service quality.
- Support co-investment in distributed, community-level infrastructure (antennas, micro-towers, solar-power kits).
- Use hybrid governance structures as a model for future telecom and digital policy reforms.

6. Build Decentralized and Crisis-Proof Digital Infrastructure

Policy Implications:
Centralized telecom and financial systems remain highly vulnerable to disruption in fragile environments.

Recommendations:
- Invest in distributed power solutions (solar, micro-batteries) for connectivity providers and digital businesses.
- Expand the use of mesh networks as backup systems by supporting pilot deployments of local networks that can operate independently of centralized internet gateways.
- Promoting community Wi-Fi hubs powered by renewable energy in shelters, markets, and dense neighborhoods to provide free or low-cost access points.
- Establishing decentralized network nodes (micro-servers, local caching, offline-capable applications) to maintain essential digital services such as e-wallet when wider internet access is unavailable.

- Encourage private-sector telecom actors to develop redundant emergency connectivity layers and rapid restoration mechanisms.
- Promote research and pilot programs on alternative routing, low-bandwidth protocols, and off-grid communication systems.

7. Strengthen Coordination Between Policy Actors, Donors, and the Private Sector

Policy Implications:
Digital resilience requires multi-stakeholder cooperation across telecom, MSMEs, digital payments, and labor markets.

Recommendations:
- Establish a Digital Resilience Working Group involving MAS, MTIT, telecom providers, digital payment companies, ISPs, incubators, and donor agencies.
- Align humanitarian and development programming with telecom recovery priorities.
- Mobilize donor support for connectivity restoration funds targeting informal ISPs and small MSMEs.
- Prioritize coordinated interventions that combine connectivity, financial access, and digital commerce support.

8. Apply a Gender-Sensitive Approach to Digital Economy Recovery

Policy Implications:
Women-led micro-enterprises adapted quickly but face additional barriers in digital access, liquidity, and mobility.

Recommendations:
- Provide dedicated digital tools and training programs for women-owned businesses.
- Increase access to digital payments and micro-finance tailored for female entrepreneurs.
- Support the establishment of women-focused digital hubs within shelters and community centers.
- Integrate women's digital market access into national MSME recovery frameworks.

8. References

Electronic Frontier Foundation. (2025, June). *Connectivity is a lifeline, not a luxury: Telecom blackouts in Gaza threaten lives and digital rights.* https://www.eff.org/deeplinks/2025/06/connectivity-lifeline-not-luxury-telecom-blackouts-gaza-threaten-lives-and-digital

GSMA. (2024). *The state of mobile internet connectivity in conflict zones*. https://www.gsma.com

Mourtada, R. (2025, October 14). *Keeping Gaza connected: Building crisis-resilient internet access*. Internet Society Pulse. https://pulse.internetsociety.org/blog/keeping-gaza-connected-building-crisis-resilient-internet-access

Palestinian Central Bureau of Statistics. (2025). *Telecommunications indicators*. https://www.pcbs.gov.ps/site/512/default.aspx?lang=en&ItemID=5988

7amleh. (2024, September 16). *7amleh releases report on Palestinian digital rights in the context of genocide and big tech accountability one year after the war on Gaza.* https://7amleh.org/post/report-on-palestinian-digital-rights-in-the-context-of-genocide-and-big-tech-accountability-one-year-after-the-war-on-gaza-en

Wilson Center. (2024). *Planning for resilience in and after conflict—a world away.* https://www.wilsoncenter.org/blog-post/planning-resilience-and-after-conflict-world-away

9. Annexes

9.1 Annex 1: List of Key Informant Interviews (KIIs)

A. Data from ISPs Ecosystem and Informal ISPs			
	Source	**Description**	**Contact information**
1	Ministry of Telecommunication and Information Technology	To understand the regulation of the informal ISPs in the government	https://www.mtit.gov.ps
	Telecommunication Regulatory Authority -TRA	The official body established to regulate Palestine's telecom sector	https://www.facebook.com/61554847987085/?locale=en_GB
2	Palestinian Information Technology Association - PITA	The umbrella of the ISPs ecosystem in Palestine	www.pita.ps
3	PALTEL	The Largest internet provider in Palestine, one of the internet sources for informal ISPs	www.paltel.ps
4	NetStream	One of the internet sources for informal ISPs	https://www.facebook.com/NetStream2/
5	International NGO Safety Organisation (INSO) - Palestine	Serve as the safety coordination and advisory body to the NGO community in Conflict zones	https://ngosafety.org
6	PalPay	One of the largest e-wallets in the Gaza Strip	www.palpay.ps
7	"Hisham" Internet Network	Owner of a local internet network	Hisham Ouda, 0594446669
8	Khalil Rajab Internet Network	Owner of a local internet network	Khalil Rajab, 0592224456
9	"Joda" Internet Network	Owner of a local internet network	Ala Jouda, 592220416

B. MSME Owners / Managers	
Source	**Business Speciality**
Creativity company	A leading company in building E-commerce platforms and delivering digital marketing services.
Torood Company	A leading company in Delivery services
Balaha and Zaitona	Food producer company, using E-commerce technologies.
Taqat Hub	Local work remotely Hub
3 Local Shops	Shops use informal ISPs to empower their e-payment services for their buyers.

C. Community Member	
Individual Users	Nominated by informal ISPs and MSMEs to share their experience and reflect the community's feedback based on who used internet, e-payments, or digital marketing services.
Freelancer	
Entrepreneur	