ENTERPRISE PERFORMANCE UNDER SUCCESSIVE SHOCKS

THE ROLE OF DIGITAL RESILIENCE CAPABILITY MATURITY IN CAPITAL-INTENSIVE SECTORS

By

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AGENDA

- Introduction
- Literature Review
- Research Objective and Question
- Research Methodology and Design
- Research Results
- Discussion
- Conclusions

INTRODUCTION

- Impact of Economic Shocks: Major economic disruptions, such as the 2016 oil price drop and the 2020 pandemic, had varied effects across industries. Telecommunications (as a capital-intensive sector) experienced dual impacts—lower revenues from customer slowdown but increased demand from digitalization initiatives in both crises.
- Digital Transformation (DT) as Crisis Recovery: Capital-intensive sectors like telecommunications, which have substantial investments at stake, increasingly rely on DT to enhance flexibility, improve productivity, and support recovery following economic shocks.
- Role of Telecoms in Digitalization: Telecoms became essential drivers of digitalization themselves, in many countries state-backed reforms used telecoms for broader digital services like e-government and data centers.
- Dynamic Capabilities Framework: The study uses the dynamic capabilities theory to analyze how telecoms and other capital-intensive firms leverage DT to navigate economic shocks
- Building Resilience with Dynamic Capabilities such as DT: Telecom companies can strengthen digital resilience (DR), enabling them to adapt more effectively to shocks and sustain competitive advantages.

What is the level of Digital Capabilities for a Firm in Capital Intensive industry required to have a positive impact on Firm performance after economic shocks

ACADEMIC LITERATURE REVIEW

Teece et al: Dynamic capability theory

- Firm's ability to integrate, build, and reconfigure competences
- Three Primary Activities
  - Sensing: Identifying and anticipating disruptions and opportunities
  - Seizing: Mobilizing resources and implementing strategies
  - Reconfiguring: Realigning and transforming structures and processes

Friedrich et al, Creaner: DT in Telecom Sector

- Two Major Scenarios by Friedrich
  - Simplify: Cutting unnecessary functions, replacing with digital solutions
  - Digitize: Expanding beyond traditional business, offering new services/products
- DT Journeys by Creaner
  - Internal: 1) digitally network infrastructure; 2) efficient utilization of network data; 3) digital organization and culture; 4) multiple market channels; 5) 360degree omnichannel
  - External: 6) API platform 7) limited number of new; 8) broader ecosystem in adjacent sectors; 9) different business models in eco-system.

Fitzgerald, Hinings et al: Digital Transformation

- Definition of Digital Transformation (DT)
  - Process to improve an entity through significant changes
  - Combines information, computing, communication, and connectivity technologies
- Derivative Definitions
  - Use of new digital technologies for major business improvements
  - Enhancing customer experience, streamlining operations, creating new business models
- Impact of DT through three types of digital innovations
  - Organizational forms: Digitally enabled practices, structures, and values
  - Infrastructures: Technology platforms or ecosystems
  - Building blocks: Components or modules for running the organization

Boh et al: Digital Resilience

- Digital Resiliency (DR) Definition: 1) Ability to prevail through business disruptions using digital technologies; 2)Capabilities to absorb shocks, adapt to disruptions, and transform to a new stable state
- Absorbing Major Shocks: Recovering to existing state; Effective coordination and data governance
- Adapting to Disruptions: Developing quick learning and implementation capabilities; Organizational restructuring and positive culture; Transforming to a New State

RESEARCH OBJECTIVE AND QUESTION

- Objective of the Study
  - Investigate the influence of Digital Transformation (DT) on resilience capabilities
  - Focus on the telecommunications industry
- Significant Economic Crises Analyzed
  - 2016 oil price decline crisis
  - 2020 pandemic
- Theoretical Framework
  - DT facilitates the cultivation of Digital Resilience (DR)
  - Enables transition to innovative business models
  - Facilitates expansion into new segments or adjacent sectors
- Research Question
  - What level of digital resilience maturity is sufficient for a firm in a capital-intensive industry to outperform others in overcoming economic shocks?

The hypothesis proposed asserts that companies actively fostering digital resilience capabilities exhibit superior performance following shocks, characterized by a notable rebound in financial metrics and an enhancement of their market standing, as evidenced by increased client base or revenue market share relative to competitors.

RESEARCH METHODOLOGY

- Research Basis
  - Longitudinal panel data analysis
  - Dataset includes 318 worldwide operators from 96 countries
- Analysis of groups of operators worldwide after two successive shocks:
  - 2016 oil price shock
  - 2020 pandemic shock

- Groups of operators analyzed in 2016 oil price shock
  - Operators in countries dependent on oil revenues that entered structural reforms after oil crisis.
  - Operators in countries that embarked on large scale digitalization programs and became digital leaders. These countries stimulated their telecommunication industry players to become digital innovators, and lead country-wide digitalization programs.
  - International operators that became leaders in advancing new business models with the fastest growth of non-core revenues from 2017 to 2022.
- Groups of operators analyzed in 2020 pandemic shock
  - Operators in countries – digitalization leaders.
  - Selected international operators that accelerated innovative business model implementation in 2020, during or after the pandemic lockdowns.

Conclusions are made on the impact of DR capability to improve operators' performance after shocks. The author infers key stages of maturity framework that may be used to monitor DT implementation in the organizations.

RESEARCH DESIGN

- Panel Data Analysis
  - Data from 2012 to 2022 on financial performance and market position
  - Includes revenue, subscriber base, capital expenditures, and EBITDA margin
- Calculated Attributes
  - Subscriber market share for each operator
  - Share of capital expenditure to total telecom capital expenditure
- Panel Regression Analysis
  - Impact of capital investment shares on market and financial performance
  - Uses Stata software
- DiD Regression Analysis
  - Evaluates dependency of market share on investment policy during high stringency lockdowns
- Controls:
  - unobserved heterogeneity using operator, country, and time fixed effects (differences in management, regulatory environments, and global trends
  - Clustered standard errors at the operator level for robust estimates.
  - 4G and 5G adoption, varying by country and time. A visual inspection of pre-treatment parallel trends

(1) $General\ Regression: Dependent\ Variable(it) = \beta 0 + \beta i * Independent\ Variable(it) + \alpha * Covariate(it) + \epsilon it$

(2) $DiD\ regression: Dependent\ Variable(it) = \beta 0 + \beta 1 * Time\ After\ Shock + \beta 2 * Group\ Variable + \beta 3 * (Interaction\ Variable) + \beta i * Independent\ Variable(it) + \alpha i + \epsilon it$

Var short desc	Units and description
Dependent Variables	
Total revenue	$, all revenues from core and non-core services
Service revenue	$, predominantly revenues from mobile telecommunication services
Share by revenue	%, market share by revenue in each country in a period t
EBITDA	$, operator ebitda in a period t
Ebitda margin	%, operator ebitda margin in a period t
Subs	#, Number of subscribers each year
Share by subs	%, share by subs in a country in a period t
Key Independent Variables/Covariates	
Capital Expenditure	$, Capital investments for each operator in a country in a period t
Share of capital expenditure	%, share of capital investments for each operator in a country in a period t
Capex per sub	$, Capital expenditure / # subscribers in a period t
Capex ratio to rev	%, Capital expenditure / revenue in a period t
Other control, group, interaction variables	
Tr-ment by reform after oil	Interaction variable: Treatment in countries digital leaders after oil shock
Tr-ment by digitalization after oil	Interaction variable: Treatment in countries digital leaders after oil shock
Tr-ment by BMI after oil	Interaction variable: Treatment in operators with BMI after oil shock

RESEARCH RESULTS: TESTING OVERALL SIGNIFICANCE OF INDEPENDENT VARIABLES

- **Significance of Variables:** Several variables show statistical significance at the 5% level, but only a few demonstrate a substantial contribution to firm performance, as reflected by the R-squared values.
- **Firm Performance Indicators:** Absolute indicators, such as revenues and subscriber base, are significantly influenced by capital expenditure variables.
- **Ratio-Based Indicators:** Capital per subscriber and capital-to-revenue ratios show limited impact on firm performance, with some regressions indicating negative coefficients, suggesting inefficiency at high capital levels.
- **Causal Relationships:** The study examines capital expenditure share against market share, finding significant influence, particularly in the context of competition.
- **Role of Investment Behavior:** Operators' capital investment relative to competitors plays a critical role in maintaining market share and resilience, especially during economic downturns.

Dep var	Main/covariate	R sq	Coeff	t	p
Market Share by subs	Share of Capex	0.35	0.037	3.84	0.000
	Capex	0.01	1.71e-11	2.00	0.046
	Capex Ratio to Rev	0.01	-0.005	-.8.3	0.000
	Capex per subscriber	0.02	-0.0001	-2.50	0.013
Subs base	Share of Capex	0.00	3612043	1.82	0.07
	Capex	0.63	0.0174	2.67	0.008
	Capex Ratio to Rev	0.00	-370398	-3.45	0.001
Market share by Rev	Share of Capex	0.56	.1947682	8.31	0.000
	Capex	0.01	3.21e-11	2.18	0.030
	Capex Ratio to Rev	0.04	-.0066636	-3.52	0.001
Revenue	Share of Capex	0.00	2.21e+08	1.66	0.10
	Capex	0.84	1.05	1.87	0.063
	Capex Ratio to Rev	0.00	-2.15e+07	-3.64	0.000

RESEARCH RESULTS: 2016 OIL CRISIS – TELCOS IN COUNTRIES UNDER STRUCTURED REFORMS

- **Reduced Capital Expenditure:** Operators in oil-rich nations with structural reforms have tightened capital expenditure budgets, leading to a decline in both subscriber base and profitability (EBITDA).
- **Limited Impact on Market Share:** Changes in market share were not statistically significant due to a focus on large operators, which excludes smaller telecom players from the analysis.
- **Shift to Smaller Operators:** Reforms in oil economies resulted in a subscriber shift from major incumbents to smaller operators.
- **State-Driven Investments:** Significant capital was allocated to digital and e-government projects for state goals, often unrelated to operators' core business, reducing the need for immediate ROI.
- **Challenges in Resilience:** While these investments created foundational digital infrastructure, they often misaligned with operators' strategic goals, potentially leading to over-diversification and diminished resilience following economic shocks.

Dataset 1.– 8,546 obs, 318 operators, 62 operators under treatment						
Dependent variable	Main/covariate variable	R squared	Coefficient	Std Error	t	p-value
Market Share	Treatment by Reform	0.2162	-0.010	0.007	-1.42	0.158
	Share of Capex		0.038	0.010	3.83	0.000
	Capex		1.22E-11	7.83E-12	1.56	0.12
	Capex Ratio to Rev		-0.005	0.001	-6.51	0.000
Subscriber base	Treatment by Reform	0.4774	-5818939	1518446	-3.83	0.000
	Market Share		7.15E+07	2.89E+07	2.48	0.014
	Capex Ratio to Rev		-3152492	975664.7	-3.23	0.001
	Revenue Share		-1.13E+07	4671218	-2.42	0.016
Revenue	Treatment by Reform	0.7001	-9.86E+07	7.61E+07	-1.3	0.196
	Market Share		1.52E+09	8.97E+08	1.69	0.091
	Share of Capex		8079517	3653076	2.21	0.028
	CAPEX		-1.58E+08	8.44E+07	-1.87	0.062
	Capex Ratio to Rev		0.9822036	0.5280082	1.86	0.064
EBITDA	Treatment by Reform	0.1052	-8.17E+07	4.24E+07	-1.93	0.055
	Market Share		1.05E+09	7.09E+08	1.47	0.142
	ARPU		3038568	2376444	1.28	0.202
EBITDA Margin	Treatment by Reform	0.5332	-0.068	0.025	-2.78	0.006
	Market Share		0.566	0.167	3.39	0.001
	Subs		-1.16E-09	4.54E-10	-2.57	0.011
	ARPU		-0.003	0.001	-3.71	0.00
	Share of Capex		0.314	0.058	5.45	0.00
	Capex Ratio to Rev		-0.721	0.054	-13.28	0.00
	Capex per subscriber		0.007	0.003	2.47	0.014
Revenue Share	Treatment by Reform	0.6374	-0.017	0.011	-1.62	0.106
	Market Share		0.752	0.060	12.61	0.000
	Revenue		7.21E-12	2.32E-12	3.11	0.002
	ARPU		0.001	0.000	5.36	0.000
	Share of Capex		0.171	0.023	7.55	0.000
	CAPEX		-1.62E-11	8.01E-12	-2.02	0.044
	Capex Ratio to Rev		-0.0027	0.0018	-1.5	0.136
	Capex per subscriber		-0.0004	0.0001	-2.8	0.005

RESEARCH RESULTS: 2016 OIL CRISIS – TELCOS IN COUNTRIES – DIGITAL-LEADERS

- **Minimal Impact on Operational Indicators:** Digitalization did not significantly affect capital expenditure, market share, or subscriber base.
- **Enhanced Financial Performance:** Digitalization contributed to gradual improvements in revenue and EBITDA profitability.
- **Cost Reduction through Automation:** Profitability gains were driven by cost reductions from digital solutions like contact center automation, network monitoring, and back-office process automation.
- **Revenue Growth via New Services:** Revenue growth stemmed from better subscriber management (using churn and targeting models) and introducing new services in telecom (e.g., 5G) and adjacent fields (e.g., fintech, IoT).
- **Digital Resilience (DR) Capabilities:** The development of DR capabilities helped operators achieve cost efficiencies and generate new revenue streams beyond core telecom services, boosting overall financial performance.

Dataset 2.– 8,549 obs, 318 operators, 62 operators in countries leaders of digitalization						
Dependent variable	Main/covariate variable	R squared	Coefficient	Std Error	t	p-value
Market Share	Treatment by Digital	0.5665	-0.011	0.006	-1.73	0.085
	Revenue		5.78E-12	5.37E-12	1.08	0.283
	Share of Capex		-0.005	0.007	-0.65	0.514
	CAPEX		5.04E-12	2.73E-12	1.85	0.066
	Capex ratio to Rev		-0.00400	0.00096	-4.18	0.000
	ARPU		-0.00043	0.00012	-3.51	0.001
Subscriber base	Treatment by Digital	0.5722	-1697785	2501347	-0.68	0.498
	Revenue		0.011	0.004	2.56	0.011
	Share of Capex		-3020951	2017281	-1.5	0.135
	CAPEX		-0.001	0.002	-0.44	0.658
	ARPU		-133863.1	42480.69	-3.15	0.002
Revenue	Treatment by Digital	0.6220	2.60E+08	1.37E+08	1.9	0.059
	Market Share		5.43E+08	1.30E+09	0.42	0.678
	ARPU		9941785	4719211	2.11	0.036
	Revenue Share		4.77E+08	2.60E+08	1.83	0.068
	Subscriber base		19.76744	8.150482	2.43	0.016
EBITDA	Treatment by Digital	0.9643	8.95E+07	3.70E+07	2.42	0.016
	Subscriber base		3.99E+07	1.48E+08	0.27	0.787
	Revenue Share		1.29E+08	7.04E+07	1.83	0.068
	Revenue		0.367	0.032	11.44	0.000
EBITDA Margin	Treatment by Digital	0.5370	0.034	0.030	1.13	0.258
	Market Share		0.610	0.170	3.59	0.000
	Subs		-1.05E-09	4.30E-10	-2.43	0.016
	ARPU		-0.003	0.001	-3.83	0.000
	Share of Capex		0.314	0.057	5.47	0.000
	Capex Ratio to Rev		-0.720	0.054	-13.21	0.000
	Capex per subscriber		0.007	0.003	2.51	0.013
Revenue Share	Treatment by Digital	0.6409	0.016	0.012	1.34	0.182
	Market Share		0.764	0.057	13.33	0
	Revenue		6.65E-12	2.46E-12	2.7	0.007
	Share of Capex		0.170	0.023	7.51	0

RESEARCH RESULTS: 2016 OIL CRISIS – TELCOS EMBARKED ON DIGITAL BMI

- **Revenue Growth from Non-Core Services:** Companies generating significant revenues from non-core telecom services saw improvements in both financial and operational metrics.
- **Consistent Investment Levels:** These firms did not significantly alter overall investment levels post-crisis but shifted focus toward innovative services.
- **Strategic Business Model Innovation:** Successful operators implemented new digital business models, leading to enhanced market positions and financial outcomes.
- **Role of DR Capabilities:** Strategic use of digital resilience (DR) capabilities, particularly through business model innovation, helped operators stand out after the 2016 oil crisis.
- **Improved Market Position:** DR capabilities allowed firms to achieve better market positioning and financial performance compared to peers who focused solely on core telecom services.

Dataset 1.– 8,546 obs, 318 operators, 27 operators under treatment						
Dependent variable	Main/covariate variable	R squared	Coefficient	Std Error	t	p-value
Market Share	Treatment by BMI	0.5738	-0.021	0.010	-2.05	0.041
	Revenue		6.35E-12	4.92E-12	1.29	0.198
	Revenue Share		0.213	0.035	6.1	0.000
	ARPU		0.000	0.000	-3.61	0.000
Subscriber base	Treatment by BMI	0.4711	1.27E+07	6317324	2.01	0.045
	Market Share		7.73E+07	2.88E+07	2.68	0.008
	Capex Ratio to Rev		-3144803	1005180	-3.13	0.002
	Revenue		0.010	0.004	2.49	0.013
	Revenue Share		-1.10E+07	4644759	-2.36	0.019
Revenue	Treatment by BMI	0.1265	4.52E+08	2.54E+08	1.78	0.076
	Market Share		2.18E+09	1.27E+09	1.72	0.086
	Share of Capex		3975285	5.27E+07	0.08	0.94
	ARPU		9535626	4520180	2.11	0.036
EBITDA	Treatment by BMI	0.7131	2.68E+08	1.28E+08	2.09	0.038
	Market Share		9.85E+08	5.17E+08	1.9	0.058
	ARPU		2235898	1740738	1.28	0.2
EBITDA Margin	Treatment by BMI	0.5354	0.012	0.028	0.43	0.669
	Market Share		0.606	0.175	3.47	0.001
	Subs		-1.06E-09	4.45E-10	-2.38	0.018
	ARPU		-0.003	0.001	-3.8	0.000
	Share of Capex		0.314	0.058	5.39	0.000
	Capex Ratio to Rev		-0.720	0.055	-13.19	0.000
	Capex per subscriber		0.007	0.003	2.5	0.013
Revenue Share	Treatment by BMI	0.6428	0.007	0.016	0.43	0.668
	Market Share		0.760	0.058	13.1	0.000
	Revenue		7.26E-12	2.47E-12	2.94	0.003
	ARPU		0.001	0.000	5.11	0.000
	Share of Capex		0.170	0.023	7.5	0.000
	CAPEX		-1.59E-11	7.95E-12	-2	0.046
	Capex per subscriber		0.000	0.000	-2.75	0.006

RESEARCH RESULTS: 2020 PANDEMIC – TELCOS IN COUNTRIES – DIGITAL-LEADERS

- Faster Recovery with Digitalization: Post-pandemic models confirm that operators in countries with strong digitalization programs recover more quickly, as seen in financial indicators.
- Reduced Significance in Results: Some dependencies show lower significance due to the limited observation period after pandemic lockdowns.
- Limited Observation Period: Analysis covers only 8 quarters post-lockdown, with the model assuming most lockdowns occurred in Q2 2020.
- Importance of Digital Resilience: Despite these limitations, models highlight that digital resilience capabilities contribute to quicker economic recovery.

Dataset 1.– 8,549 obs, 318 operators, 40 operators in countries leaders of digitalization with stringency > 80						
Dependent variable	Main/covariate variable	R squared	Coefficient	Std Error	t	p-value
CAPEX	Treatment by Digital		1.94e+08	9.75e+07	1.99	0.047
Revenue	Treatment by Digital	0.9507	1.46E+08	8.03E+07	1.81	0.071
	Market Share		1.44E+08	6.03E+08	0.24	0.811
	Subscribers		9.602416	4.616343	2.08	0.038
	Net Additions		0.497636	0.3911262	1.27	0.204
	Opex per Net addition		-248.297	118.0256	-2.1	0.036
	EBITDA		1.535975	0.3572819	4.3	0.000
	EBITDA per subscriber		-1918583	1774028	-1.08	0.280
	ARPU		6964416	2645764	2.63	0.009
	Capex per subscriber		-1394914	996331.7	-1.4	0.163
EBITDA	Treatment by Digital	0.6572	2.32E+08	1.18E+08	1.96	0.050
	Share of Capex		4.90E+07	5.24E+07	0.93	0.351
	CAPEX		0.3717934	0.3301853	1.13	0.261
	Subscribers		5.567267	2.325809	2.39	0.017
	Market Share		3.76E+08	4.17E+08	0.9	0.368
	EBITDA Margin		-2.50E+07	3.31E+07	-0.75	0.451
	EBITDA per user		1300412	1159321	1.12	0.263
	Capex Ratio		-1.78E+07	2.34E+07	-0.76	0.448

RESEARCH RESULTS: 2020 PANDEMIC – TELCOS EMBARKED ON DIGITAL BMI

- **Faster Recovery with Business Model Innovation:** Operators that successfully implemented business model innovation (BMI) showed quicker recovery in financial and operational indicators post-pandemic.
- **Positive Digital Resilience Impact:** Despite limitations, the trend supports the positive role of digital resilience in enhancing operators' performance after economic crises.
- **Lower Statistical Significance**: The results have lower significance due to a shorter observation period and a smaller group of BMI-leading operators.

Dataset 1.– 8,549 obs, 318 operators, 13 operators with BMI strategies with stringency > 80						
Dependent variable	Main/covariate variable	R squared	Coefficient	Std Error	t	p-value
CAPEX	Treated by BMI with lockdown stringency 80	0.0663	3.29e+08	1.86e+08	1.77	0.078
Revenue	Treated by BMI with lockdown stringency 80	0.2285	6.04E+08	3.58E+08	1.69	0.093
	Market Share		2.11E+09	1.30E+09	1.62	0.105
	ARPU		8683018	4375641	1.98	0.048
	Population		10.93468	6.615597	1.65	0.099
	Capex per subscriber		-532456.1	601851.1	-0.88	0.377
	Capex Ratio to Rev		-1803189	1.07E+07	-0.17	0.867
EBITDA	Treated by BMI with lockdown stringency 80	0.0544	4.31E+08	2.42E+08	1.78	0.077
	Share of Capex		1.16E+08	5.89E+07	1.98	0.049
	Market Share		1020000000	706000000	1.44	0.151
	EBITDA margin		-2.82E+07	3.52E+07	-0.8	0.423
	EBITDA per subscriber		1.42E+06	1.31E+06	1.08	0.281
	Capex ratio to rev		-1.35E+07	2.01E+07	-0.67	0.503
Subs	Treated by BMI with lockdown stringency 80	0.0033	2.21E+07	1.22E+07	1.81	0.071
	GDP per Capita		784.0255	455.4668	1.72	0.086
	Net Add share in total		2533186	2034906	1.24	0.214

DISCUSSION

- Digital Transformation and Recovery: Digital transformation programs helped telecom operators, particularly those with high digital resilience, recover faster after economic shocks.
- Stage-Based Impact on Performance: Operators at lower maturity stages showed weaker post-shock performance, while those achieving demand-driven optimization or innovative business models saw better results.
- Demand-Driven Optimization: Operators in digital leadership countries optimized internal operations and improved EBITDA through effective management of subscriber bases but showed limited market expansion.
- Business Model Innovation (BMI) Benefits: Operators focusing on BMI outperformed others in financial and market results by expanding into adjacent sectors and leveraging new revenue sources.
- Ecosystem Development Potential: While ecosystem-building wasn't directly measured, it's seen as the next strategic step for operators excelling in BMI, enhancing resilience and market performance.
- Dynamic Capabilities Theory Alignment: The research supports that digital resilience, as a dynamic capability, enhances a firm's agility to adapt to disruptions, seize opportunities, and reconfigure resources to maintain a competitive edge during economic shocks.

Digital Resilience Maturity Levels: The study introduces a digital resilience maturity framework, outlining stages from foundational infrastructure to ecosystem integration, each impacting resilience differently.

DIGITAL RESILIENCE CAPABILITY MATURITY FRAMEWORK

Stage	Stage 1	Stage 2	Stage 3	Stage 4
Maturity Capability Stage	Digital groundwork	Demand-Driven Optimization	Business Model Expansion	Eco-system Integration
Scope	• Building digital infrastructure (technology, organization, processes)	• Adhering to digital stakeholder demand (achieving efficiency in digital operations, effective up selling)	• Building innovative digital business models (new roles in value chain or adjacent sectors, elements of cross selling of services)	• Effectively integrating core and new businesses achieving synergetic effect in up and cross selling
Research reference	• Operators in oil dependent countries	• Operators in countries with digital leadership	• Operators with strategic BMI approach	
Dynamic capabilities Theory				
Sensing	• Monitor digital trends and disruptions	• Gather stakeholder feedback and analyze data	• Identify opportunities in adjacent sectors	• Monitor technological advancements and partnerships
Seizing	• Invest in foundational digital infrastructure	• Implement advanced digital tools	• Develop new digital business models	• Form strategic alliances
Reconfiguring	• Integrate new tech into existing processes	• Update processes based on feedback	• Restructure processes for innovation	• Continuously adapt business models

CONCLUSIONS

- Impact of Digital Transformation on Resilience: The study examines how digital transformation boosts resilience for telecom companies, aiding recovery from economic shocks like the 2016 oil price drop and 2020 COVID-19 pandemic.
- Digital Resilience Maturity: Findings show that basic digital infrastructure alone doesn't ensure faster recovery; only advanced digital resilience maturity, involving operational efficiency and innovative business models, drives competitive advantage post-shock.
- Industry-Specific Insights: The focus on telecommunications provides unique insights into how digital capabilities affect performance in capital-heavy sectors, addressing a less-explored area in resilience research.
- Comprehensive Data Analysis: Using longitudinal data (2012-2022) across two major shocks, the study offers a robust view of digital resilience in diverse economic conditions, supporting the digital resilience maturity framework.
- Practical Managerial Implications: Managers can use the digital resilience maturity framework to monitor digital transformation, ensuring sufficient capabilities for competitive recovery after economic disruptions.
- Future Research Directions: The study suggests exploring digital resilience in other sectors and investigating the role of digital ecosystems, which may provide added resilience and faster recovery advantages in post-shock periods.

Empirical Evidence of Benefits: Quantitative analysis post-shock supports that advanced digital resilience and innovation improve financial and market performance, reinforcing the importance of mature digital capabilities.

DATA MANAGEMENT

- Data Sources
  - GSMA database on world operators (2012-2022)
  - Our World in Data database
  - IMD World Digital Competitiveness Ranking 2022
- Data Merging and Analysis
  - Statistical techniques in Stata package
  - Regression analysis performed in Stata
  - Full dataset: 8456 observations, 318 operators, 108 countries, quarterly from 2012Q1 to 2022Q2
- Data Accessibility
  - Publicly available data sources
  - GSMA database requires paid subscription
- Data is available from the author upon request