

Digital restructuring of porter's five-forces model: Empirical evidence from the smartphone industry

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Abstract

Since its formulation in 1979, Porter's five-forces model has long served as a canonical tool within strategic management for analysing industrial structures and appraising industry profit-making potential, and is widely adopted in business consulting, academic research and industrial analysis. Nevertheless, pervasive template-driven application is observed in practical operations and academic studies. Most extant research merely treats the five-forces model as a checklist-style completion instrument, neglecting its profound industrial-economics theoretical underpinnings. System-conducted empirical research that examines the model's explanatory boundaries with a single representative industry as the analytical carrier remains scarce. Grounded in the industrial-economics Structure-Conduct-Performance (SCP) paradigm, this paper systematically reconstructs the complete theoretical lineage of Porter's five-forces model and clarifies its core causal logic: *industrial structure shapes competitive intensity, and competitive intensity determines average industrial returns*. Drawing on the global smartphone industry as a consistent case throughout the text, theoretical elaboration and industrial empirical analysis are conducted across five dimensions: intensity of rivalry among existing competitors, threat of new entrants, bargaining power of suppliers, bargaining power of buyers, and threat of substitutes. It is found that the global smartphone industry presents a competitive landscape characterised by "two high, two moderate and one low": rivalry among incumbent competitors is extremely intense, buyers possess high bargaining power, suppliers hold moderate-to-high bargaining power, the threat of substitutes ranges from low to moderate, and the threat posed by new entrants stands at moderate-to-low. The industry generally sits within the mature phase of its lifecycle, featuring fierce competitive pressures and low average sector-wide profitability, and constitutes a consumer-electronics sector with an overall unfavourable industrial structure. Conceived within an industrial-economy context, the conventional five-forces model exhibits salient analytical limitations when confronted with contemporary industrial realities defined by the rise of digital platforms and ecosystem-centred competition. It fails to characterise the intricate competitive dynamics embedded within digital ecosystems, offers insufficient explanations for the mechanisms underpinning platform-mediated two-sided network effects, and lacks analytical dimensions for complements and strategic ecosystem partners. To address these deficiencies, the Multi-Forces Framework (MFF) is introduced as a theoretical extension instrument. Supplementary analysis of digital-ecosystem dynamics within the smartphone industry is delivered from three perspectives: operating-system platforms, application ecosystems, and digital-service revenue models. The innovations of this study lie in the completion of theoretical tracing, force-oriented empirical assessment and theoretical extension for digital-economy scenarios within a unified analytical logic. An integrated, empirically actionable research framework for industrial-competition analysis under digitalisation is thereby provided, alongside pragmatic reference points for consumer-electronics firms' strategic positioning and industrial decision-making.

Keywords: Porter's five-forces model, industrial structure, smartphone industry, digital ecosystem, multi-forces framework, strategic management

Introduction

1. Research Background and Problem Formulation

Within modern analytical frameworks for firms' external strategic environments, the five-forces competition model proposed by Porter in 1979 occupies a landmark position in both academic discourse and practical application. The model transforms the classic SCP paradigm of industrial economics, re-orienting a paradigm originally devised for macro-level public-policy analysis into a practically operable strategic-diagnostic tool for corporate managers. A core proposition is established: inherent structural attributes of an industry shape five competitive forces. The aggregate competitive intensity generated by the interplay of these forces defines the long-run average profit ceiling of the sector. Internal operational efficiency and managerial competence can only exert influence within return boundaries predetermined by industrial structures. In other words, corporate profitability is conditioned not merely by internal operational performance and R&D capabilities, but

also by structural characteristics of the relevant industry. Prior to the emergence of the five-forces model, strategic-management scholarship prioritised firm-level internal perspectives, concentrating on how resource endowments, organisational capabilities and internal efficiency shape business performance. The five-forces model shifted part of the analytical focus towards external industrial contexts, prompting scholars and corporate practitioners to reflect on industrial selection and structural modification rather than concentrating exclusively on internal-process optimisation. This conceptual shift substantially enriched research perspectives within strategic management and cemented the model's status as one of the most widely deployed analytical instruments in strategic curricula and business-consulting reports.

Notwithstanding its merits, the five-forces model is frequently reduced to standardised fill-in templates in pedagogical practice, commercial consulting and numerous empirical studies. Many analyses mechanically enumerate

the relative strength of each competitive force while disregarding the underlying SCP-paradigm logic, yielding superficial descriptive outputs that fail to address critical strategic questions: which structural drivers compress sector-wide returns, and why prevailing profitability profiles emerge. Such template-heavy deployment undermines the practical value of the five-forces framework.

Attention must also be paid to the historical context of the model's genesis. Developed during the 1970s and 1980s, an era dominated by industrial economics, the five-forces model presupposed clearly demarcated industrial boundaries and competition centred on physical-product transactions within linear value chains, with well-defined distinctions between upstream actors, downstream actors, competitors and substitutes. Since the early twenty-first century, digital technologies have reshaped commercial logics across numerous sectors. Platform-driven business models, ecosystem collaboration and integrated hardware-software architectures have become dominant competitive modalities in high-technology industries. The smartphone sector represents a paradigmatic case of digital transformation. Competition among handset manufacturers is no longer confined to hardware specifications such as chipsets, camera modules and physical design, but extends to integrated ecosystems spanning underlying operating systems, developer-community cultivation, cloud-service deployment and cross-device interoperability. Given that large-scale digital-platform-enabled ecosystem competition had not yet materialised when Porter devised his framework, the extent to which the conventional five-forces model can adequately explain contemporary industrial-competitive realities has become a subject of sustained debate within strategic-management research (Lu, 2019).

The smartphone industry combines physical-goods manufacturing with digital-software-service attributes. While retaining value-chain configurations typical of traditional manufacturing, it is deeply embedded within commercial mechanisms including digital platforms, network effects and ecosystem architectures. It therefore constitutes an ideal empirical setting for testing the boundary conditions of established theories. Following a period of rapid expansion, global smartphone markets have entered saturated stock-phase conditions.

A salient paradox characterises the sector: hardware margins remain thin, yet leading participants secure substantial gains via ecosystem-based operations. This empirical reality poses challenges for conventional industrial-competition-analytical frameworks. Against this backdrop, three core research questions are formulated. First, what are the complete theoretical origins, underlying assumptions and core propositions of Porter's five-forces model, and how is the SCP paradigm translated into the five-forces analytical framework? Second, when the global smartphone industry is adopted as an empirical setting, what assessments of the five competitive forces can be derived using the five-forces framework, and what structural mechanisms account for persistently low sector-wide profitability? Third, what intrinsic limitations constrain conventional five-forces analysis within digital-economy contexts, and how can theoretical extensions via the Multi-Forces Framework achieve integrated analysis of hardware-sector structures and digital-ecosystem competition?

2. Research Objectives, Significance and Paper Structure

Four specific research objectives are set. First, systematic mapping of the academic genealogy of Porter's five-forces model is undertaken, alongside clarification of its presuppositions and internal causal chains to correct cognitive biases stemming from template-driven practical application and restore the original theoretical connotations of the model. Second, empirical evaluation of the five competitive forces is performed for the global-smartphone-industry case. Industrial-structural characteristics and profitability constraints are assessed, and mechanisms underlying profit compression for hardware brand-owners are unpacked. Third, three core limitations of conventional five-forces analysis when applied to digital-platform-ecosystem competition are identified. The Multi-Forces Framework is introduced and deployed to deliver supplementary digital-ecosystem-oriented analysis for the smartphone industry, demonstrating complementarities between original and extended frameworks. Fourth, theoretical and practical managerial implications are synthesised, yielding an integrated research paradigm for competitive analysis within consumer-electronics sectors.

Existing scholarship on the smartphone industry mostly delivers static cross-sectional five-forces analyses that describe competitive conditions at discrete time points. Few studies trace the SCP-paradigm roots of the five-forces model or conduct supporting theoretical extensions for digitally-mediated competition. This paper establishes a complete research chain spanning theoretical reconstruction, industrial empirical testing and digital-era theoretical extension. Explanatory power of the five-forces model within mature consumer-electronics sectors is validated, and its boundary conditions are explicitly delineated. Contributions are made to scholarly discussions concerning strategic-theory adaptation within digital-economy contexts, and theoretical reference points are supplied for competitive analysis of hardware-software-integrated industries. For managers operating within consumer-electronics firms, this study facilitates movement beyond superficial SWOT or template-based five-forces assessments. Constraints originating in hardware-sector industrial structures are made visible, alongside novel competitive moats created by digital-platform ecosystems, informing product-portfolio decisions, ecosystem investment and strategic positioning. For industry analysts and researchers, an evaluative approach accommodating both physical-industrial structures and digital-ecosystem dynamics is provided, mitigating analytical blind spots arising from exclusive hardware-oriented focus. Within tertiary-education strategic-management curricula, the material may serve as teaching material linking five-forces theory with digital-industry case evidence, counteracting mechanical template-application habits among learners.

The paper comprises seven chapters. Chapter One constitutes the introduction, setting out research background, articulating research questions, defining research objectives, theoretical and practical significance, and outlining paper organisation and research methodology. Chapter Two presents a literature review reconstructing the theoretical genealogy of the five-forces model, the substance of the SCP paradigm and dynamic-evolution perspectives on industrial structure. Existing

five-forces-oriented empirical studies of communications-electronics sectors are reviewed alongside literature documenting challenges posed by digital economics to conventional models.

Chapter Three delivers itemised five-forces empirical analysis for the global smartphone industry, evaluating rivalry among existing competitors, threat of new entrants, bargaining power of suppliers, bargaining power of buyers and threat of substitutes against industrial datasets and sector-specific characteristics. Chapter Four synthesises five-forces evaluations, generates competitive-force rating tables, interprets dynamic-evolution trajectories of smartphone-industry structures and explains mechanisms driving low sector-wide profitability. Chapter Three identifies three core limitations of Porter's five-forces model within digital-economy settings: absence of ecosystem-relevant dimensions, inadequate handling of network-effect mechanisms, and insufficient attention to complementary-partner value. Chapter Six introduces the Multi-Forces Framework (MFF), explicates its theoretical logic, and delivers supplementary digital-ecosystem analysis for the smartphone industry across operating-system platforms, application ecosystems and digital-service revenue models. Chapter Seven concludes the study, outlining theoretical contributions and managerial implications, acknowledging research limitations and proposing avenues for future investigation. References follow APA-7 formatting and include 24 SCI/SSCI-sourced publications with associated DOIs.

3. Research Methodology

Literature-review methods and case-study methodology are adopted. For literature analysis, Chinese- and English-language SCI- and SSCI-journal publications on the SCP paradigm, Porter's original five-forces texts, platform-related network effects, digital ecosystems and the Multi-Forces Framework (MFF) are systematically collected and reviewed. Core-concept definitions and theoretical developmental trajectories are clarified; viewpoints from different scholars are contrasted to establish the study's theoretical foundation. For case-study work, the global smartphone industry is treated as a single case within concept-driven qualitative case-study research prioritising theory testing and theoretical extension. Public global handset-shipment statistics and authoritative industrial-consultancy reports are referenced to assign strength ratings to each of the five competitive forces and characterise competitive configurations. Comparative analysis between the conventional five-forces framework and the extended MFF framework enables theoretical dialogue and assessment of the explanatory capacity and limitations of the original model. This qualitative study prioritises logical theoretical deduction and interpretation of industrial phenomena rather than large-sample statistical validation. Generalisation of findings to alternative industrial contexts requires prudent contextual consideration.

Literature Review

1. Academic Positioning and Theoretical Origins of the Five-Forces Model

Porter first published the five-forces competition model in the *Harvard Business Review* in 1979, with full theoretical

systematisation presented in the 1980 volume *Competitive Strategy*. The five-forces model is not entirely original work; its direct intellectual origin resides in the industrial-economics SCP (Structure-Conduct-Performance) analytical paradigm. Within the conventional SCP paradigm, structural market attributes including market concentration, entry-barrier height, product-differentiation levels and agent switching costs constrain corporate behavioural choices. Firm-level decisions on pricing, R&D, advertising and capacity adjustment ultimately shape sector-wide profit rates. Early SCP-paradigm research was principally undertaken by governments and industrial economists from a macro public-policy standpoint to analyse industrial monopolies and competitive order, informing anti-trust policy formulation. Porter's contribution resides in the translation of this macro-industrial-policy-oriented paradigm into an analytical instrument usable from corporate-strategy vantage points.

Abstract market structures are decomposed into five observable competitive forces: rivalry among existing competitors, threat posed by potential entrants, bargaining power of suppliers, bargaining power of buyers, and threat of substitutes. Aggregation of these five forces defines an industry's overall competitive pressure and profit ceiling. Internal firm-level resource endowments and operational performance can only operate below this ceiling, representing the core logic of the five-forces model. In a seminal 2008 ^[10] retrospective contribution, Porter emphasised that industry profitability is not stochastic but systematically determined by industrial-structural attributes. Prior to the popularisation of the five-forces model, strategic-management scholarship prioritised internal-firm perspectives, emphasising firm heterogeneity, internal efficiency and resource-based theories exemplified by Barney's resource-based view of the firm, which seeks to explain how sustained competitive advantage derives from idiosyncratic corporate resources.

The five-forces model redirected analytical attention towards external industrial environments, prompting researchers to interrogate industrial-segment selection and possibilities for reshaping competitive contexts rather than focusing narrowly on internal-process optimisation. It functions not merely as a descriptive tool for mapping industrial conditions but as a diagnostic device encouraging analysts to identify structural drivers eroding industry profits and to pinpoint loci for defensive competitive-advantage construction. It is important to recognise that the resource-based view and the five-forces model are not mutually exclusive theoretical standpoints. Porter proposed an important integrative formulation: *firm profitability = industrial structure + relative competitive position*. Industrial structure establishes upper bounds for average sector returns as externally imposed constraints that individual firms cannot unilaterally alter. A firm's relative market position determines whether returns exceeding sector averages can be captured, representing an endogenous firm-specific variable. External industrial conditions and internal corporate capacity jointly explain performance disparities across market participants. This insight reminds analysts that industrial-competition assessments require integration of external-structural and internal-resource-capability perspectives.

2. Dynamic Properties of Industrial Structure

In numerous practical applications, the five-forces model is misinterpreted as a static snapshot instrument where scoring of five forces at a single time point completes analysis. Original Porter-scholarship nonetheless consistently stresses that industrial structures possess pronounced dynamic-evolution properties. Relative stability represents a transient condition, while change constitutes the norm. Macro-environmental shifts captured within PEST frameworks, technological disruption, regulatory adjustments and industrial-lifecycle progression continuously modify the relative strength of competitive forces and reshape sector-wide profit margins. The global smartphone industry offers a telling illustration. Relative intensities of rivalry, upstream-supplier bargaining power and substitute threats shifted substantially across feature-phone eras, early-smartphone high-growth phases and saturated-stock-market phases. High-quality five-forces analysis consequently cannot be limited to static cross-sectional snapshots. Temporal dimensions must be incorporated to observe how force intensities evolve alongside industrial-lifecycle progression. Many existing empirical studies neglect this dynamic lens, relying on single-period static assessments and generating findings with limited explanatory power. Distinction between template-driven five-forces exercises and rigorous industrial-structural analysis rests heavily on adoption of evolutionary perspectives.

3. Existing Five-Forces Empirical Research on Communications-Electronics Industries

A substantial body of SSCI-journal work deploys the five-forces model for empirical investigations of consumer-electronics, smartphone and telecommunications sectors. Kabeyi (2018) ^[4] studied global smartphone manufacturing and identified an oligopolistic market configuration with substantial entry barriers, high buyer bargaining power stemming from product homogenisation, and intense inter-firm rivalry, with multiple forces jointly compressing sector-wide profit margins. Lim *et al.* (2020) ^[6] examined China's smartphone market and demonstrated that performance among domestic leading handset vendors is strongly affected by rivalry intensity and consumer-bargaining power. Mugo (2020) ^[7] delivered five-forces-based empirical analysis for Kenya's telecommunications sector and verified the model's capacity to explain performance variation among communications-sector firms.

Supplementary consumer-behaviour-oriented research is available. Shi *et al.* (2018) ^[13] investigated brand loyalty within smartphone markets and identified that digital-platform-driven cognitive-lock-in effects partially offset high buyer bargaining power, a nuance poorly captured by conventional five-forces frameworks. Xia *et al.* (2022) ^[14] adopted a global-value-chain perspective and reported high concentration within upstream smartphone-component markets conferring strong supplier bargaining power. Industrial value flows towards upstream component manufacturers, leaving downstream brand-assemblers with limited residual gains. Two pervasive limitations are identifiable across extant empirical studies. First, most analyses remain confined to hardware-product-level boundaries and rarely address novel competitive mechanisms associated with digital-platform

ecosystems. Second, research is predominantly composed of static cross-sectional assessments, with limited discussion of historical-evolutionary trajectories of industrial structures. These limitations motivate wider scholarly debate regarding boundary conditions for the five-forces model within digital-economy environments.

4. Challenges Posed by Digital Economics to Porter's Five-Forces Model

Conceived within an industrial-economy era, the five-forces model centres analytical units on linear value chains and physical-product transactions. The rise of platform economics, network effects and digital ecosystems has exposed interpretive limitations, motivating multiple SSCI-journal publications exploring model modification and supplementation. Bruijl (2026) ^[2] proposed the Five-Forces-Plus enhancement model. It is argued that digital-asset accumulation, algorithmic governance and geopolitical constraints interact structurally with the original five competitive forces. Digitalisation blurs traditional industrial boundaries and accelerates competitive-advantage erosion. Digital-dynamics, algorithmic and geopolitical pressures should therefore be incorporated within industrial-competition-analytical frameworks to upgrade conventional models.

Dedeke (2026) ^[3] developed the Multi-Forces Framework (MFF). Complete rejection of Porter's original model is not advocated; instead, supplementary Digital-Ecosystem-Forces (DEF) modules are proposed. Conventional five-forces analysis retains responsibility for physical-transaction-oriented competitive assessment, while DEF modules address platform mechanisms, network effects, complement goods, user lock-in and digital-service revenues. Parallel deployment of both frameworks improves analytical suitability for hardware-software-integrated digital-industry contexts. Digital-innovation research by Nambisan. (2017) ^[8] highlights blurred industrial boundaries and ecosystem-collaboration characteristics inherent to digital-innovation activity. Analytical frameworks anchored on single-firm or single-industry units tend to underestimate strategic value originating from complementary-partner relationships and overemphasise competitive antagonism at the expense of synergistic value creation. Similarly, Selander *et al.* (2013) ^[11] argued that within digital-ecosystem contexts, competitive advantage is derived substantially from synergistic interactions among ecosystem complementors rather than exclusively from vertical value-chain bargaining.

Two-sided-market indirect-network-effect mechanisms, first systematically formalised by Katz & Shapiro (1985) ^[5], describe mutually reinforcing interdependencies between distinct platform-user groups generating self-reinforcing positive feedback loops. No corresponding analytical dimension exists within Porter's original five-forces formulation. Consensus emerges from review of relevant literature: wholesale repudiation of the five-forces model is not advanced within academia; instead, clear boundary conditions are acknowledged. Supplementary analytical dimensions are required for industries driven primarily by platform dynamics. The smartphone sector constitutes an ideal test case for such arguments: hardware-manufacturing-and-sales processes lend themselves well to conventional five-forces evaluation, whereas operating-system, app-store and cloud-service

domains represent archetypal digital-ecosystem competition, illustrating complementarities between original and extended frameworks.

Empirical Five-Forces Analysis of the Smartphone Industry

Global smartphone shipments reached 1.25 billion units in 2025, representing a 2 % year-on-year increase and marking the highest output recorded since 2021. Markets are nonetheless fundamentally situated within stock-phase conditions. Consumer replacement cycles have extended to three years or longer. Sector-wide growth no longer originates from new-user acquisition; volume expansion for individual firms depends principally on capturing market share from rival participants. Market concentration continues to rise, with combined market share held by the top-five vendors (Apple, Samsung, Xiaomi, vivo, OPPO) exceeding 70 %. An oligopolistic “one-leader-plus-several-strong-players” configuration characterises the industry. Five competitive forces are evaluated sequentially below.

1. Intensity of Rivalry Among Existing Competitors: Extremely High

Six core drivers define rivalry intensity within Porter’s theoretical schema: number and size distribution of competitors, market-growth rates, fixed-cost proportions, consumer-switching costs, product-differentiation levels and industry-exit barriers. Conditions within the global-smartphone sector satisfy nearly all criteria associated with intense inter-firm rivalry. First, competitor count and size distribution. Despite rising market concentration and exit of smaller brands, substantial parity persists among leading vendors. Apple maintains dominant positioning within global premium-handset segments, achieving 240.6 million-unit shipments in 2025. Samsung holds second-ranked global status. Xiaomi, vivo and OPPO compete fiercely within emerging-market and mid-price segments. Market-share expansion by any leading participant provokes retaliatory counter-moves from competitors; share gains without rival push-back are scarcely attainable. Even with higher concentration and exit of smaller-scale operators, rivalry severity has not diminished among the five major oligopolists.

Second, market-growth rates. Global smartphone markets are saturated and stock-oriented. Overall market size expands only marginally. Business growth is predicated on poaching existing users from competitors, normalising price warfare, large-scale marketing campaigns and channel-resource competition. Rivalry is further intensified. Third, high fixed-cost structures. Substantial outlays are required for R&D, production-facility construction, global-patent portfolio development and offline-distribution-network build-up. High fixed-cost burdens compel firms to sustain elevated capacity-utilisation rates. Capacity-reduction initiatives are resisted, reinforcing incentives for price-cutting and promotional activity.

Fourth, consumer-switching costs. Mature data-migration tools are available across the Android ecosystem. Contacts, photographs and local-application records transfer conveniently between Android-brand devices, keeping switching costs low and stimulating user-poaching among Android vendors. Migration from Apple’s iOS to Android incurs moderate switching costs associated with habit

adaptation and loss of accumulated-ecosystem assets. Nevertheless, substantial cross-ecosystem handset-replacement flows persist, and lock-in does not bind the vast majority of consumers. Fifth, product-differentiation levels. Mid-range and entry-level smartphones adopt homogeneous chipsets, display panels and memory components. Hardware specifications converge strongly. Limited hardware-based differentiation renders price a salient purchasing determinant and exacerbates inter-firm rivalry. Superior product-and-experience differentiation is achieved by Apple through its closed-loop iOS ecosystem.

Sixth, industry-exit barriers. Major handset-market participants are large integrated technology groups. Smartphone operations are tightly coupled with corporate-brand identity and broader-technology portfolios. Complete withdrawal from smartphone markets remains difficult even amid segment-level losses. Elevated exit barriers sustain loss-making participants within the market, perpetuating competitive intensity rather than permitting rivalry relief via firm exit. Synthesising these six drivers, rivalry intensity among existing competitors within the smartphone industry is rated extremely high and constitutes the primary force compressing hardware-brand profitability.

2. Threat of New Entrants

Threats originating from potential entrants are principally determined by entry-barrier height. Key Porter-defined barriers include economies of scale, brand equity, channel-access capabilities, technical-patent accumulation and supply-chain governance. While smartphone-industry entry barriers remain substantial, they are not entirely insurmountable. The threat of new entrants is therefore classified as moderate-to-low rather than extremely low. First, brand barriers. Smartphones represent consumer-electronics goods deeply embedded within everyday-user routines. Established user mental models prevail. Building market recognition for a new brand requires multi-billion-dollar marketing expenditure and extended market-cultivation timelines, carrying significant commercial-failure risk. Consumers impose high reliability and after-sales-service expectations on handset brands, hindering rapid reputation-building for new-market participants.

Second, channel barriers. Incumbent leading vendors have constructed comprehensive global-distribution networks comprising official online storefronts, physical retail premises, regional distributors and overseas agents. New entrants face formidable obstacles when attempting to replicate comparable global-reach sales infrastructures within short timeframes. Third, supply-chain barriers. Smartphone-component supply chains involve hundreds of upstream vendors supplying chipsets, display panels, memory modules and camera hardware. Volume advantages enjoyed by established large-scale buyers secure component-priority-allocation and preferential procurement pricing. Low order volumes for new-market entrants yield inferior purchasing terms, creating inherent pricing disadvantages.

Fourth, technical-patent barriers. Modern smartphones integrate numerous technological modules including mobile-communications hardware, chipsets, imaging algorithms, fast-charging systems and artificial-intelligence capabilities. Sustained high-volume R&D investment and

extensive patent-portfolio construction are required to mitigate litigation exposure. Technical-patent barriers are substantial. Threats from new entrants are not entirely absent, however. Large cross-industry technology groups endowed with abundant capital and foundational-technology assets possess partial handset-market-entry capacity and represent non-negligible latent threats. Even large-scale cross-sector entrants can scarcely overturn established oligopolistic market configurations. In summary, the threat of new entrants within the smartphone industry is moderate-to-low. High entry barriers constitute the sector's principal protective mechanism. Direct market disruption from external newcomers remains limited, and competitive pressures derive primarily from rivalry among established large-scale incumbents.

3. Bargaining Power of Suppliers

Most smartphone-brand operators function as assembly-oriented enterprises. Critical components are supplied by a small set of upstream oligopolistic firms. High concentration within key-component markets and substantial switching costs for downstream vendors confer moderate-to-high bargaining leverage on suppliers. Effects are unevenly distributed across handset-manufacturer cohorts. Large-scale leading buyers partially offset supplier-bargaining power via procurement volume, while smaller-brand participants occupy disadvantaged negotiating positions. Within the chipset domain, Qualcomm and MediaTek dominate mobile-SoC markets. TSMC enjoys near-monopoly positioning within advanced-process-node wafer-foundry services. Substantial lead-time investment in driver adaptation, system tuning and imaging calibration is required should downstream handset vendors switch chip-set suppliers, producing prohibitive switching costs. Within display markets, high-end flexible-OLED-panel supply is heavily concentrated within Samsung Display. The DRAM and NAND-Flash memory sectors are dominated by Samsung, SK Hynix and Micron, which collectively control more than 95 % of global production capacity. Memory-market dynamics are subject to pronounced cyclical volatility. Upstream manufacturers adjust component prices by modulating production volumes, leaving downstream handset brands with limited negotiating leverage. Supplier-bargaining-power impacts are heterogeneous across firm sizes. Apple and Samsung secure long-term price-locking contracts and priority capacity allocation via massive-volume order books, mitigating adverse effects of component-price inflation. Smaller handset brands, constrained by limited procurement scale, accept higher component-acquisition costs and less favourable transaction conditions. Disparities in supply-chain negotiating power reinforce industry-level Matthew effects, with industrial value continuously shifting towards upstream-component manufacturers. In aggregate, supplier-bargaining power within the smartphone industry is rated moderate-to-high.

4. Bargaining Power of Buyers

Buyer groups within smartphone markets are differentiated into end-consumers, telecommunications operators and small-scale resellers. Bargaining strength is most pronounced among end-consumer populations. Porter identifies large-buyer volumes, weak product differentiation, low buyer-switching costs and

high-market-information transparency as conditions fostering strong buyer-bargaining power. End-user smartphone markets satisfy nearly all these conditions.

First, abundant product offerings span all price brackets. Mid-tier and entry-level devices exhibit substantial hardware homogenisation, and perceived value differentials across competing products are limited. Second, high market-information transparency prevails. Online-review ecosystems and price-comparison platforms facilitate straightforward cross-product evaluation of specifications, pricing and user feedback, substantially diminishing information asymmetry between purchasers and vendors. Third, consumer-switching costs remain low. Seamless data-transfer mechanisms within the Android ecosystem enable brand-switching driven purely by value-for-money considerations. Under such market conditions, end-consumers exercise considerable market-disciplining influence. Handset-manufacturers rely persistently on seasonal price promotions, purchase-incentive gifts and after-sales-service enhancements to attract customers. Deviations from market-expected pricing trigger rapid-sales declines. Consumer-driven price pressure compresses gross margins for hardware-brand operators. Historically, telecommunications operators exercised substantial buyer-bargaining power through subsidised-contract-handset distribution channels. Expansion of e-commerce and brand-direct sales diversified purchasing channels, reducing operator-bargaining leverage. Individual small-scale resellers possess limited procurement volumes and depend heavily on handset-brand operators, conferring minimal independent bargaining capacity. Overall, buyer-bargaining power within the smartphone industry is rated high. Buyer-side forces continuously squeeze gross-profit margins for hardware-brand vendors.

5. Threat of Substitutes

Within Porter's definition, substitutes represent goods deploying distinct technological pathways yet fulfilling identical core-user needs. Smartphones constitute multi-functional integrated consumer terminals. Bidirectional substitution dynamics characterise the sector: smartphones have displaced numerous standalone consumer-electronics devices, while alternative intelligent terminals erode smartphone-usage time within specific contexts. On one substitutional dimension, smartphones have progressively displaced portable cameras, MP3 players, GPS navigators, voice recorders and handheld gaming hardware. No single consumer-electronics product can comprehensively replicate the full functional scope of smartphones in the short-to-medium term. Fundamental user-level demand for handsets remains robust.

On the reverse-substitution dimension, tablet computers, notebook personal computers and smartwatches divert usage occasions away from smartphones. Tablets supersede handsets for audio-visual-entertainment and note-taking-oriented learning tasks. Notebook devices undertake complex professional workflows including office-productivity work, programming and video-editing. Smartwatches handle message notifications and basic voice-call functions during exercise, meetings and commuting, reducing physical-handset-retrieval frequency. These products cannot fully substitute smartphone functionality, yet they erode usage scenarios, extend consumer-replacement cycles and suppress upper bounds

for sector-market growth. No comprehensive smartphone-substitute is foreseeable in the short run, yet partial-substitution forces intensify over time and dampen long-term-market-growth potential. The threat of substitutes is accordingly assessed as low-to-moderate.

Composite Five-Forces Evaluation and Dynamic Interpretation of Industrial Structure

Following the item-by-item empirical analysis presented in Section 3, composite ratings for the five competitive forces within the smartphone industry are synthesised. With respect to rivalry among existing competitors, the intensity is rated extremely high, constituting the primary source of downward pressure on industry profits, where price wars have become commonplace. The threat of new entrants is rated moderate-to-low; protective industry barriers limit external disruption, and competition is concentrated among established incumbent giants. Supplier bargaining power is rated moderate-to-high. Profit is transferred upwards to upstream component oligopolies, exacerbating the industry-wide Matthew effect. Buyer bargaining power is rated high, compelling firms to adopt price-cutting and promotional activities and squeezing profit margins for hardware-branded manufacturers. The threat of substitutes ranges from low to moderate. While complete replacement of smartphones remains unfeasible, substitute offerings erode use-case opportunities and depress the industry's growth ceiling. Collectively, the competitive landscape of the global smartphone industry may be summarised as "two high, two moderate, one low", exhibiting characteristics typical of the mature phase of the industry life-cycle: intense competitive pressure and low average industry profitability, corresponding to an overall unfavourable structural configuration for consumer-electronics participants. Most industry profits flow to upstream component suppliers, while a proportion of profits is transferred to end-consumers through market competition. Smartphone brand-owners are only able to capture limited returns derived from product assembly, brand marketing and after-sales service activities. The sole structural advantage across the sector stems from substantial entry barriers. Such high barriers deter numerous potential external entrants and preserve viable operating space for existing leading manufacturers within a stock-market competitive environment. Nevertheless, average industry profitability remains persistently compressed by the combined influence of multiple competitive forces. Empirical conclusions derived from this section are corroborated against findings reported by Kabeyi (2018)^[4].

Industrial structures are not static entities. Technological change and market-environment shifts generate three salient dynamic patterns within the smartphone industry circa 2025. First, modest market recovery occurs alongside intensified concentration of gains among leading firms. Total-shipment volumes rebound marginally, yet revenues, high-volume orders and premium-supply-chain resources become further concentrated within the top-five vendors. Operating space for smaller-scale brands continues to shrink as Matthew effects strengthen. Second, competitive modalities evolve. Transition from fragmented-market conditions towards oligopolistic rivalry among five major participants is observed. Higher market concentration does not eliminate competition but reshapes its focal points. Pure hardware-price-war activity diminishes in relative

importance. Technology-driven innovation, differentiated brand positioning and ecosystem-based competition grow in significance. Third, scale-derived benefits for leading enterprises become increasingly prominent. Large-volume procurement mitigates supplier-bargaining pressure and amortises substantial R&D expenditures. Simultaneously, oligopolistic firms face mounting innovation imperatives to identify revenue streams beyond hardware sales. Digital-software-service businesses become priority-investment domains for major vendors. These dynamic-sector-characteristics deliver an important analytical lesson: five-forces analysis must transcend static scoring exercises. Temporal tracking of shifting competitive-force intensities across industrial-lifecycle stages is required for full strategic interpretation. Reliance on isolated time-slice assessments yields incomplete understanding of industrial realities.

Three Core Limitations of Conventional Porter's Five-Forces Model Within Digital-Economy Settings

Analysis presented in Chapters Three and Four confirms that Porter's five-forces model delivers powerful explanatory capacity for smartphone-hardware-sector industrial structures, cost pressures and profit constraints within physical-goods sales. Contemporary smartphone-industry competition, however, extends well beyond hardware domains. Operating systems, application ecosystems and digital-service-oriented value creation generate novel sources of competitive advantage inadequately captured within conventional five-forces frameworks. Three intrinsic limitations are identified.

Porter's original five-forces framework is built upon analytical units centred on physical-product transactions, individual firms and discrete industries. Primary attention is directed towards direct antagonistic interactions among market actors. Within digital-era contexts, substantial competitive capacity derives from ecosystem-integration capabilities. Rivalry between Apple, Huawei and Xiaomi encompasses not merely hardware-specification comparisons but holistic ecosystem contests spanning operating-system infrastructures, application portfolios, cloud-service offerings and cross-device interoperable user experiences. No evaluation metrics for ecosystem scale, user stickiness or data-loop-generated competitive moats are embedded within the conventional five-forces toolkit. Apple's sustained superior-gross-profit performance is difficult to explain relying exclusively on conventional five-forces reasoning. Apple faces extremely intense incumbent rivalry and strong buyer-bargaining power within hardware markets. Nevertheless, lock-in mechanisms originating from the iOS ecosystem deliver profitability materially exceeding sector-average benchmarks. Long-run competitive moats and profit-making potential created by digital ecosystems are severely underestimated by traditional-analytical frameworks.

Industrial-era value chains follow linear upstream-to-downstream value-flow patterns. Digital platforms operate as archetypal multi-sided markets reinforced by direct and indirect network effects that amplify competitive advantages through self-reinforcing feedback cycles. Smartphone operating-systems exemplify two-sided platforms: one platform side comprises end-user consumers, and the other consists of software developers. Larger-consumer-user bases increase developer incentives

to build and optimise applications for the platform. Expanding-application richness, in turn, enhances platform-value propositions for consumers, establishing self-strengthening positive feedback loops that build substantial ecosystem-oriented moats. Even full hardware-specification parity achieved by competitors cannot replicate such cyclic-reinforcement mechanisms. Developed prior to large-scale platform-economy emergence, Porter's original framework lacks dedicated dimensions addressing platform power and two-sided network effects. Phenomena whereby certain platform-enabled firms transcend conventional industrial-profitability regularities therefore resist straightforward explanation.

The five-forces analytical logic prioritises competition, antagonism and bargaining dynamics: competitors contest market share, potential entrants seize market space, upstream-and-downstream agents conduct bargaining contests, and substitutes compete for customer bases. Zero-sum antagonism constitutes the dominant framing. Analytical modules addressing complementary-collaborative relationships are absent. Within smartphone digital ecosystems, mobile applications, cloud-storage services, paid-membership entitlements, wearable hardware and vehicle-phone-interconnection systems represent complements to physical-handset hardware. Complement richness directly shapes holistic-user-experience quality. In many commercial contexts, ecosystem quality exerts greater influence over consumer-purchase decisions than hardware-specification attributes. Dedicated analytical dimensions for complements and ecosystem collaborators are missing from Porter's five-forces formulation, inhibiting interpretation of competitive-advantages originating from ecosystem synergies. In summary, conventional Porter's five-forces analysis retains strong explanatory utility for hardware-industrial-structure assessment yet exhibits clear analytical blind spots when confronted with digital-ecosystem-oriented competition. The Multi-Forces Framework (MFF) proposed within scholarly literature advocates retention rather than wholesale rejection of the five-forces model. Supplementary Digital-Ecosystem-Forces (DEF) modules are superimposed, enabling complementary deployment of both frameworks for more holistic industrial-competition assessment.

Supplementary Digital-Ecosystem-Oriented Analysis Using the Multi-Forces Framework

Complete competitive analysis for hardware-software-integrated industries comprises two components according to MFF reasoning. Module One corresponds to Porter's conventional five-forces model, supporting analysis focused on physical-hardware-products and linear-value-chain transactions. Cost constraints, hardware-pricing pressures and competitive configurations within physical-product markets are appraised. Module Two introduces supplementary Digital-Ecosystem-Forces (DEF), dedicated to examination of platform-governance rules, network-effect mechanisms, complement-ecosystem development, user-lock-in dynamics and software-service revenue models. Non-material competitive moats and novel profit-generation pathways originating within digital domains are identified. Mutual complementarity

characterises the two modules, rendering the combined analytical approach particularly suitable for consumer-electronics and internet-enabled-terminal sectors featuring deep hardware-software integration. When applied to smartphone-industry research contexts, conventional five-forces analysis answers the question: *How substantial are competitive pressures within hardware-manufacturing-and-sales segments, and why are hardware-product profit margins persistently compressed?* DEF-oriented digital-ecosystem analysis addresses a second question: *How can certain vendors escape low-hardware-profit traps and capture excess commercial returns via platform-and-digital-service operations?* Supplementary analysis proceeds across three dimensions: operating-system platforms, application ecosystems and digital-service revenue models.

The global smartphone-operating-system market is dominated by two oligopolistic platforms: iOS and Android. Operating-systems have evolved beyond pure-software-tool functionality to become rule-setting authorities and value-allocation hubs for entire digital ecosystems. iOS represents Apple-exclusive closed-loop infrastructure characterised by unified-version releases and rigorous permission controls. Highly consistent cross-device experiences are secured, supporting tightly bounded commercial ecosystems that enforce dual-sided lock-in for end-consumers and software developers. Android operates under open-licensing arrangements, granting authorisation to vendors including Xiaomi, OPPO and vivo for deep customisation and secondary modification. Openness facilitated rapid-scale-expansion of the broader Android cohort. Conventional five-forces analysis evaluates only hardware-market competition and cannot capture top-tier ecosystem moats originating from operating-system infrastructures. Long-run developmental upper bounds for handset vendors are substantially conditioned by operating-system-ecosystem capacity. Apple's high gross-profit performance derives not merely from hardware-design quality and brand equity but from advantages generated by the closed-loop iOS ecosystem. Android-cohort vendors may achieve hardware-specification parity with Apple-manufactured devices yet cannot replicate commercial dividends stemming from closed-platform architectures. These structural dynamics evade detection within conventional five-forces-analytical frameworks.

Commercial value embedded within operating-systems is ultimately realised through application ecosystems. Physical-smartphone hardware serves purely as carrier infrastructure; mobile-application software delivers core utility consumed by end-users. App Store alongside Android-application-marketplace infrastructures constitute archetypal two-sided platforms aggregating large-scale consumer-user communities and software-developer populations, generating powerful indirect-network-effect dynamics. From the consumer-user perspective, greater application abundance enhances device-utility value and reduces willingness to depart from the given-system ecosystem. From the software-developer perspective, larger-platform-user bases improve commercial-return prospects, incentivising sustained product-optimisation investment. Self-reinforcing positive feedback cycles consolidate ecosystem-oriented competitive moats. Even when new-market entrants overcome supply-chain,

brand-building and distribution-channel entry barriers identified within conventional five-forces analysis, construction of fully mature application ecosystems from baseline conditions remains practically infeasible. Hardware-technology and production-capacity gaps may be closed within relatively short time horizons, yet digital-ecosystem development requires cumulative long-term cultivation. These digital-domain entry barriers fall outside the scope of entry-barrier analysis within Porter's five-forces framework.

Profit-analysis perspectives within conventional five-forces frameworks are confined to returns generated by physical-hardware-product sales. Within ecosystem-driven-competition phases, handset-manufacturers unlock secondary-growth trajectories via revenues and profits originating from software-and-digital-service activities. Apple constitutes a benchmark case for this commercial transformation. Service-segment gross margins associated with App-Store commission revenues, Apple-Music streaming, iCloud-storage subscriptions and TV+ video-content memberships substantially outperform hardware-sales-margins. Service-business operations have become a critical profit pillar for Apple. Leading Android-ecosystem vendors within China similarly invest in cloud-service offerings, paid-membership programmes, thematic-resource libraries and cross-device-synergistic digital-services to elevate software-service-revenue proportions within total corporate turnovers. Such hardware-software-hybrid profit-making models transcend traditional manufacturing-sector commercial logics. Firms may tolerate low-or-thin-hardware-product margins, or even near-zero hardware profitability, while capturing superior long-run returns through subsequent user-consumption of digital-service offerings. Conventional five-forces analysis exposes cut-throat-price-competition pressures within hardware domains yet remains blind to stable long-run-revenue streams generated by digital-service-business lines. Important strategic insights emerge from MFF-oriented analysis. Firms are not condemned to passive acceptance of externally imposed industrial-structural constraints. Resource investment in digital-ecosystem construction and complementary-partner-network formation can partially overcome profit ceilings defined by pre-existing industrial structures. Corporate-strategic options encompass not merely adaptation to external-market conditions but also deliberate reshaping of industrial-competitive environments.

Conclusions, Theoretical Contributions, Managerial Implications and Research Limitations

1. Principal Findings

First, Porter's five-forces model is rooted within the industrial-economics SCP paradigm. Its core causal chain holds that *industrial-structure shapes competitive intensity, and competitive-intensity determines average-industry-profit-making potential*. This core proposition receives empirical support from global-smartphone-industry evidence. The "two high, two moderate and one low" competitive configuration explains intrinsic mechanisms driving profit compression for hardware-brand operators. Intense incumbent rivalry and high-consumer-bargaining power constitute primary profit-suppression drivers. Moderate-to-high

supplier-bargaining power further diverts returns away from downstream-market participants. Elevated entry barriers block substantial inflows of external competitors. While incapable of sector-wide disruption, substitute threats suppress upper-market-growth boundaries. Second, industrial-structures exhibit intrinsic-dynamic-evolution attributes. Across feature-phone epochs, high-growth-smartphone-phases and contemporary stock-phase-ecosystem-competition conditions, relative intensities of the five competitive forces undergo continuous transformation. Five-forces analysis therefore cannot be reduced to static-cross-sectional scoring exercises. Dynamic interpretation incorporating industrial-lifecycle perspectives is essential for comprehensive understanding of industrial-competitive realities. Third, Porter's conventional five-forces model delivers robust explanatory capacity within industrial-economy-contexts yet manifests three intrinsic limitations when applied to digital-platform-ecosystem-oriented competition: absence of dedicated analytical dimensions for digital-ecosystem-competitive dynamics; insufficient explanatory capacity for multi-sided-platform-network-effect mechanisms; and neglect of strategic value originating from complements and ecosystem collaborators. Wholesale rejection of the five-forces model is unwarranted for digital-industry contexts. Supplementary deployment of the Multi-Forces Framework (MFF) represents a preferable approach. Conventional five-forces analysis handles physical-hardware-industrial-structure assessment, while DEF digital-ecosystem-modules address platform-ecosystem-oriented competition, with complementary deployment of both analytical systems. Fourth, competitive dynamics within smartphone markets have undergone hierarchical evolution. Contestation has moved beyond pure hardware-specification rivalry towards holistic ecosystem-oriented competition encompassing operating-systems, application portfolios and digital-service provision. Firms may deliberately invest in platform-ecosystem construction and complementary-partner-network formation to partially transcend profit ceilings imposed by pre-existing industrial-structures. Corporate-strategy involves not merely passive adaptation to external-industrial-conditions but also deliberate shaping of industrial-competitive environments.

2. Theoretical Contributions

First, a complete research chain spanning theoretical reconstruction, empirical testing and digital-context-oriented theoretical extension is established. Template-driven misapplication of the five-forces model within practical-practice contexts is critiqued, and foundational SCP-paradigm logic underpinning the framework is re-emphasised. Second, empirical testing of Porter's five-forces model is performed using the global-smartphone-industry case. Boundary conditions for the model are explicitly delineated, and complementarities between conventional five-forces analysis and MFF extensions are demonstrated. Reference material is provided for application of classic-strategic-theory within digital-economy-contexts. Third, an integrated industrial-competition-analytical paradigm is generated for hardware-software-integrated digital-terminal industries. Industrial assessment must simultaneously evaluate

hardware-sector-structural constraints and novel competitive moats and profit-making-opportunities originating within digital-ecosystem domains, avoiding exclusive focus on physical-goods-oriented bargaining dynamics.

3. Practical Managerial Implications for Firms

First, consumer-electronics-sector analysts are advised to avoid mechanical template-driven five-forces deployment. Five-forces evaluations must trace structural root-causes beneath observable-industrial phenomena. Temporal dimensions should be incorporated to track shifts in competitive-force intensities alongside industrial-lifecycle progression rather than relying exclusively on static-snapshot assessments. Second, when hardware-sector-industrial-structures are intrinsically unfavourable, excess-profit generation relying purely on hardware-product-operations becomes difficult. Investment in digital-ecosystem development including operating-system capacity building, application-ecosystem collaboration, cloud-service-product delivery and cross-device-complementary-product portfolios is recommended to counteract hardware-oriented-profit-pressure. Third, differentiated competitive strategies are appropriate for firms of varying scale. Large-scale leading organisations endowed with substantial resource pools may invest in platform-ecosystem construction and pursue deliberate reshaping of industrial-competitive configurations. Smaller-brand participants lack resource bases required for comprehensive-ecosystem development. Focus on niche-segment positioning is advisable, avoiding direct head-to-head ecosystem-level confrontation with oligopolistic incumbents and pursuing competitive advantage within sub-sectors where pressures exerted by the five competitive forces are attenuated.

4. Research Limitations and Future-Research Outlook

This study constitutes qualitative-single-case research focused exclusively on the global-smartphone-industry setting. Caution is therefore required when generalising findings to alternative industrial contexts. Multi-case-study designs targeting hardware-software-integrated sectors such as intelligent-electric-vehicles and wearable-device industries are recommended for future research to further test generalisability of the Multi-Forces Framework (MFF). Second, qualitative strength ratings are assigned to five competitive forces and DEF-digital-ecosystem-forces within this study. Quantifiable-measurement-indicator systems are not constructed. Subsequent scholarship may develop operational indicator sets enabling quantitative scoring of five-forces and DEF-digital-ecosystem-force dimensions, improving objectivity of analytical outputs. Third, geopolitical dynamics and global-supply-chain-risk impacts on smartphone-industry-competitive structures receive only cursory attention within this paper. These themes constitute promising avenues for deeper investigation in future work.

Discussion

1. Dialogue with Existing Empirical Research

Findings from earlier five-forces-oriented smartphone-industry studies are revisited. Kabeyi (2018)^[4] characterised global handset-manufacturing as an oligopolistic sector with high entry barriers and intense inter-firm rivalry. Core judgements within the present study

align with those conclusions. Two meaningful points of divergence emerge, however. First, Kabeyi's analysis remains confined to hardware-manufacturing domains, failing to distinguish hardware-product-competition from digital-ecosystem-competition layers. Firm-level-profitability is directly inferred from five-forces outputs, creating difficulty in explaining Apple's superior-profit performance amid pervasive low-hardware-margins across the sector. Layered analysis via the MFF Multi-Forces Framework in the present study differentiates hardware-and-ecosystem-domains. Sector-average-returns are constrained by five-forces dynamics, yet individual firms may transcend hardware-oriented-profit ceilings through digital-ecosystem-derived advantages, closing interpretive gaps within earlier scholarship. Findings published by Lim *et al.* (2020)^[6] focusing on China's domestic market highlight rivalry intensity and consumer-bargaining power as profit-compression drivers. Observations from the present study support this viewpoint. It is further demonstrated that buyer-bargaining-power effects are modulated by ecosystem-lock-in mechanisms. Cognitive-lock-in and ecosystem-inertia dynamics documented by Shi *et al.* (2018)^[13] attenuate real-world-buyer-power manifestations: within-ecosystem brand-switching among Android-users confers high-bargaining leverage, yet buyer-power diminishes during cross-ecosystem-migration episodes. Bargaining-power of buyers within five-forces frameworks is consequently not a fixed constant but modulated by digital-ecosystem-complementary-mechanisms, a mediating effect frequently overlooked within static-template-based five-forces exercises (Lu, 2019). The assessment of "moderate-to-high supplier-bargaining power" in this paper aligns with global-value-chain-oriented findings from Xia *et al.* (2022)^[14], according to which upstream-component oligopolists capture disproportionate industrial value. Heterogeneity in supplier-bargaining-power impacts is further revealed: supplier leverage does not operate uniformly across downstream participants. Large-scale buyers mitigate pressure through long-term-contracting and volume-procurement arrangements, whereas smaller-brands endure intensified-cost-compression, amplifying industry-level Matthew effects. Disparate-profit outcomes among firms operating within identical-industry contexts are thereby explained: industrial-structures determine average-sector-returns, yet individual-firm-exposure to five-forces-pressures is modified by relative-market-position and ecosystem-resource endowments. Porter's (2008)^[10] integrative formulation ($\text{firm profitability} = \text{industrial-structure} + \text{relative competitive position}$) receives corroboration. Some prior scholarship advocates complete rejection of Porter's five-forces model for digital-economy-settings and promotes wholesale replacement with entirely novel-competition-analysis systems. Empirical evidence derived from this case does not support wholesale-rejection arguments. Within hardware-R&D, procurement, manufacturing and physical-distribution value-chain segments of the smartphone industry, conventional five-forces analysis retains strong explanatory utility. Interpretive breakdown occurs within platform-, ecosystem- and two-sided-network-effect-dominated domains. A more viable analytical pathway involves supplementation rather

than rejection, following MFF-Multi-Forces-Framework logic: conventional-framework deployment for linear-value-chain analysis, with supplementary DEF-digital-ecosystem-modules addressing multi-sided-platform-competition, operated in complementary tandem.

2. Boundary-Conditions and Practical-Application Caveats for the Multi-Forces Framework (MFF)

Validity of the MFF framework is demonstrated using smartphone-industry evidence, yet MFF is not universally applicable and possesses identifiable boundary-conditions requiring attention in scholarly-and-practical-deployments. First, MFF is best suited for hardware-software-integrated industries where physical-products are tightly coupled with digital-platforms and developer-rich-ecosystems: smartphones, intelligent-electric-vehicles, wearable-devices and smart-home-appliances constitute representative examples. For purely-manufacturing sectors such as steel-production, cement-manufacturing and basic-chemical-processing, competition is predominantly organised around physical-transactions within linear-value-chains. Two-sided-network-effects and large-scale-developer-ecosystems are largely absent. Conventional five-forces analysis proves sufficient in such contexts. Superimposition of DEF-digital-ecosystem-modules yields limited analytical gains while increasing analytical complexity. Second, MFF does not amount to simple checklist-style addition of supplementary forces. Misinterpretation may occur whereby MFF is understood as “five-forces-plus-extra-variables”. Core logic instead resides in layered decomposition of competitive domains. Layer-One addresses physical-product-markets using five-forces-analysis. Layer-Two evaluates digital-platform-ecosystem-markets via DEF-modules. Interaction occurs across layers: hardware-market-share shapes platform-user-base-magnitude, and platform-ecosystem-quality conversely modulates hardware-product-competitiveness. Complete isolation of the two analytical layers is inappropriate. Within smartphone-industry contexts, hardware-shipment-volumes constitute foundational inputs for operating-system-platform-network-effects, while operating-system-ecosystem-quality improves hardware-product-attractiveness, generating positive-reciprocal-feedback dynamics. Third, differential weighting applies to sub-dimensions within DEF-digital-ecosystem-modules. For firms without proprietary-underlying-operating-systems, the operating-system-platform dimension represents exogenously imposed constraints beyond easy corporate modification. Analytical emphasis should shift towards application-ecosystem-adaptation and differentiated-digital-service provision. For organisations controlling foundational-operating-system-assets, operating-system-rule-setting authority constitutes the most consequential-ecosystem-variable. Weighting of individual dimensions must be adjusted according to firm-level-resource-endowments in practical-analysis contexts. Mechanical uniform scoring across dimensions should be avoided.

3. Further Discussion on “Deliberate Corporate Reshaping of Industrial-Structures”

Porter’s original five-forces model is sometimes criticised for structural-determinist leanings that depict firms as purely passive recipients of given-industrial-structures constrained by profit-ceilings established by five-forces dynamics. Later-Porter-scholarship and MFF-extended-framework reasoning adopted within this study nonetheless indicate that firms are not entirely structurally determined. Strategic-actions may modify relative-force intensities or enable construction of entirely new digital-ecosystem-competitive-arenas to unlock supplementary-profit-space. Two pathways for industrial-structural modification are observable within smartphone-industry contexts. Pathway-One operates within conventional five-forces boundaries: supplier-bargaining-power is mitigated via volume-procurement arrangements; buyer-bargaining-power is attenuated through brand-differentiation initiatives; entry-barriers are elevated via patent-portfolio-and-ecosystem-construction. These correspond to traditional-competitive-strategy approaches pursued within pre-existing hardware-sector-value-chains. Within mature-stock-phase-consumer-electronics-industries, marginal returns from such structural-modification activity are limited. Competitor imitation occurs rapidly, facilitating competitive-attribution dynamics and hindering sustained-excess-profit generation. Pathway-Two involves transcendence of pre-existing-physical-product-competitive-dimensions through construction of new digital-ecosystem-competitive-arenas. Physical-hardware-devices function as traffic-entry-points. New-profit-pools are generated through operating-system-mediated-application-revenue-sharing, cloud-service-offerings and membership-service-provision. Under this strategic approach, firms do not seek to alter five-forces-intensities within hardware-markets but establish separate digital-markets governed by network-effect dynamics. This explains the high-strategic-significance of ecosystem-building for mature-consumer-electronics-enterprises. High barriers and substantial-failure-risks accompany digital-ecosystem-construction, however. Ecosystems cannot be built rapidly through capital-expenditure alone. User-scale attainment, developer-incentive-mechanism design and prolonged iterative-development cycles are prerequisites. The vast majority of smaller-scale handset-brands lack resource endowments for comprehensive-proprietary-ecosystem-construction. Misguided large-scale-ecosystem-investment may disperse finite-resources and accelerate operational deterioration. This reinforces managerial-implication arguments articulated earlier: large-scale leading-participants may pursue ecosystem-environment-shaping initiatives; smaller-vendors are better served by niche-market-focused strategies rather than direct head-to-head ecosystem-oriented-competition against oligopolistic incumbents.

4. Pedagogical Implications for Strategic-Management Teaching Within Digital-Era Contexts

Within tertiary-education-strategic-management curricula, five-forces-model exercises frequently train students to

produce template-driven checklists recording force-strength-assessments only. Two prevalent learning-misconceptions are highlighted by findings from this smartphone-industry-case study and require correction in teaching practice. Misconception-One: treatment of the five-forces model as a static checklist. Pedagogical emphasis should stress dynamic-evolution properties of industrial-structures. Force-intensities shift materially across industrial-lifecycle-stages for any given-industry. Static-snapshot-analysis delivers limited analytical value. Temporal-axis and lifecycle-perspective integration should be encouraged. Misconception-Two: direct inference of firm-level-performance outcomes from five-forces-assessments. Students frequently deduce guaranteed-profitability or losses for individual firms purely from five-forces-outputs, disregarding distinctions between sector-average-returns and firm-specific-returns, alongside moderating variables including relative-competitive-position and digital-ecosystem-factors. The smartphone-industry exemplifies this tension: overall hardware-sector-structures are unfavourable, yet selected firms secure high-profitability through ecosystem-based advantages. Teaching must reinforce the principle that industrial-structures establish constraint conditions rather than directly determining individual-firm-fate. Furthermore, given proliferation of hardware-software-integrated-digital-industry-case-material within contemporary-business-contexts, curricula should avoid rigid adherence to industrial-era-classic-theory. Selective introduction of extended-frameworks including MFF is recommended. Learners should be guided to differentiate physical-value-chain-competition dynamics from platform-ecosystem-competition logics, building capacity for critical evaluation of boundary-conditions constraining classic-theoretical-tools.

5. Research Limitations and Future-Research Topics

Key limitations have been outlined in Chapter Seven. Additional granularity for future-research-agendas is provided within this discussion section. First, this study constitutes qualitative-single-case-research grounded within the global-smartphone-industry-context. Multi-case-study-work targeting intelligent-electric-vehicles, smart-watches and smart-televvisions is proposed for future investigation. Cross-sector comparison across multiple hardware-software-integrated-industries enables identification of differential explanatory power for DEF-digital-ecosystem-sub-dimensions within the MFF framework. Intelligent-automotive-sectors, for instance, feature hardware-value-chains and in-vehicle-operating-system-ecosystems yet exhibit supply-chain configurations, regulatory constraints and user-switching-cost-profiles distinct from smartphone-markets. Boundary-conditions governing framework applicability may be further clarified. Second, qualitative-strength-ratings are assigned to five-forces and DEF-ecosystem-forces within this study. Quantifiable-operational-indicator-systems remain undeveloped. Subsequent research may design measurement-scales: industrial-structure-measurement-metrics for five-forces-assessment alongside indicators quantifying operating-system-oligopoly-degrees, application-ecosystem-richness, network-effect-strength and

user-lock-in-magnitude for DEF-module-application. Semi-quantitative-empirical-assessment drawing upon industrial-datasets would advance beyond purely-qualitative-framework-formulation.

Third, geopolitical-factors, export-controls, tariff-regimes and technology-blockade-impacts receive passing mention only and are not formally incorporated within analytical frameworks. Global-consumer-electronics-supply-chains are internationally distributed. Geopolitical-shocks modify supplier-bargaining-power, entry-barrier configurations and substitute-threat-profiles. Future scholarship may treat geopolitical-constraints as exogenous-moderator-variables and investigate how geopolitical-disruptions reshape competitive-landscapes within integrated five-forces-MFF-analytical settings. Fourth, comparative-industry-oriented-research-designs are feasible. Performance-outcomes for firms building comprehensive-proprietary-ecosystems can be contrasted against participants relying on third-party-operating-system-ecosystems.

Econometric-analysis using panel-dataset-resources may empirically quantify digital-ecosystem-force-contributions to corporate-profitability, complementing qualitative-case-study-findings. Fifth, ecosystem-collapse and platform-decline-phenomena warrant investigation. Existing MFF-related-literature predominantly emphasises positive-feedback-cycle-driven-advantages generated by network-effects. Reverse-self-reinforcement-dynamics triggered by large-scale-developer-exits and user-migration-events remain comparatively under-explored. Future-research may examine digital-ecosystem-decay-mechanisms to improve theoretical coverage of both positive-and-negative-network-effect-trajectories.

As a canonical industrial-structure-analysis instrument, Porter's five-forces model derives from the SCP industrial-economics paradigm. Its core logical architecture retains validity amid digital-economy-transformations. Constrained by its historical-era origins, however, analytical blind spots persist concerning platform-network-effect dynamics, digital-ecosystem-operations and complementary-partner-collaboration phenomena. Evidence obtained from global-smartphone-industry-case-analysis demonstrates sustained robust explanatory capacity for five-forces-analysis within physical-hardware-value-chain-contexts, accounting for pervasive high-competitive-pressure-low-profit-conditions confronting hardware-brand-operators. Complete understanding of ecosystem-derived-excess-profit-performance among leading-market-participants nonetheless necessitates supplementary DEF-digital-ecosystem-analysis originating within the MFF Multi-Forces Framework. Distinction must be maintained between physical-product-competition-realms and digital-platform-ecosystem-competition-realms. Two extremes should be avoided when conducting industrial-competition-analysis within digital-era-contexts. Mechanical template-driven-application of classic-models that disregards novel-mechanisms associated with digital-business-models represents one pitfall (OpenAI, 2026)^[3]. Wholesale repudiation of conventional-strategic-theory and complete abandonment of industrial-structure-analysis-insights constitutes the second. A balanced approach requires clarification of

classic-theory-origins, intrinsic-content and boundary-conditions, alongside targeted theoretical supplementation adapted to sector-specific-characteristics. For business-practitioners operating within mature-consumer-electronics-industries where hardware-profit-margins are persistently eroded by multiple-competitive-forces, clear-appraisal of organisational-resource-endowments is essential. Well-resourced-leading-firms may pursue digital-ecosystem-investment to unlock supplementary-profit-space. Organisations constrained by limited-resource-bases should prioritise niche-market-focused strategies and identify viable-operating-spaces within externally imposed industrial-structural constraints.

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