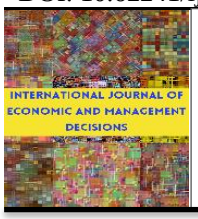
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CEO Marketing experience and investment efficiency through innovation capability and corporate governance in digital industries

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ABSTRACT

Executive functional experience may shape how firms evaluate uncertain investments, yet its organizational consequences depend on the capabilities and governance arrangements through which decisions are implemented. This study examines the association between chief executive officer marketing experience and investment efficiency in publicly listed nonfinancial firms operating in digital industries. Drawing on upper echelons theory, agency theory, the resource-based view, and dynamic capability theory, it proposes innovation capability as a mediating mechanism and corporate governance quality as a moderating condition. The reported panel analysis covers 2014–2025 and includes 4,326 observations. Marketing experience is positively associated with the reported investment-efficiency measure across baseline specifications. The innovation analysis is consistent with a positive indirect relationship, while the governance interaction indicates a stronger conditional association under higher governance scores. Subsample estimates are larger in highly digital industries, large enterprises, and private firms, although formal between-group tests are not supplied. Alternative specifications retain positive coefficients. These results support examining marketing experience as a potential contribution to investment judgment rather than treating marketing leadership exclusively as a driver of revenue growth. However, the stated negative-absolute-residual definition of investment efficiency conflicts with its positive reported descriptive values. The outcome transformation, sample construction, and complete estimation outputs therefore require reconciliation before causal or economic magnitudes can be established. The study contributes an integrated account of executive experience, organizational innovation, and governance complementarity, with implications for executive selection, investment oversight, and the evaluation of intangible investments.

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1. INTRODUCTION

Corporate investment increasingly involves resources whose value depends on uncertain customer responses and complementary organizational changes. Data infrastructures, digital services, artificial intelligence

applications, and customer platforms can create new opportunities, but their benefits are rarely determined by technical performance alone. A system may operate as intended while failing to attract customers or support a viable business model. An apparently promising service may require coordination with partners before it produces returns. These conditions make the interpretation of markets relevant to investment decisions. They also raise a question about leadership: whether professional experience in marketing helps a chief executive officer identify, evaluate, and implement investments more efficiently.

Investment efficiency concerns the allocation of resources relative to opportunities and constraints. It is distinct from the amount invested, the growth of the enterprise, and its immediate profitability. A firm can expand expenditure while committing resources to projects with weak expected value. Another can preserve short-term earnings by withholding investment from opportunities that warrant development. Both overinvestment and underinvestment can therefore represent inefficiency. The difficulty lies in observing the appropriate benchmark. Because researchers cannot directly observe every project's expected value, empirical studies often assess deviations from estimated investment levels. Such measures provide useful indicators, but their interpretation depends on the prediction model and the economic circumstances of the firm [12], [13].

Chief executives influence this allocation process by directing attention, setting priorities, appointing decision makers, and interpreting uncertain information. Their functional experience may affect which signals they consider credible and which risks they recognize. Upper echelons theory provides a basis for relating executive backgrounds to organizational outcomes [1]. It does not imply that a professional biography determines behavior. Experience is a proxy for accumulated knowledge, attention, and social relationships whose relevance varies across situations. A marketing background may improve the interpretation of demand without providing expertise in technology architecture or financing. The strategic contribution therefore depends on how individual knowledge is combined with the expertise available elsewhere in the organization.

Marketing experience is relevant because investment decisions often require judgments about customers, adoption, competitive positioning, and commercialization. Executives who have worked in market development, sales strategy, branding, or customer management may have encountered repeated situations in which technical attractiveness and market value diverged. Such experience can support more disciplined questions about the intended user, the conditions of adoption, and the assumptions behind projected demand. These potential benefits should not be confused with an automatic preference for greater expenditure. Better information can justify increasing investment in an overlooked opportunity or reducing commitment to a weak project. Efficiency concerns the appropriateness of the choice rather than its direction.

The digital context makes these judgments particularly important. Digital products can be revised rapidly, customer interactions generate extensive information, and platform relationships can change access to markets. These features create possibilities for learning, but also introduce uncertainty about data quality, dependence, and commercial sustainability. Firms may invest in fashionable technologies without establishing how they improve a customer proposition. Conversely, uncertainty can discourage investment even when experimentation would provide useful information. Digital transformation research emphasizes that technological adoption interacts with strategy, capabilities, and organizational change [5]. This study locates executive marketing experience within that interaction rather than presenting digitalization as a uniform environmental condition.

Recent research already connects marketing experience with investment efficiency. Qiu, Zhang, and Yin examine the relationship directly and identify uncertainty and relational hold-up as relevant explanations [11]. The present paper therefore does not claim to introduce the connection between marketing leadership and efficient investment. Its proposed extension concerns how organizational innovation capability and governance quality help explain the association in digital industries. Establishing that extension requires separating the executive characteristic from the organizational processes and conditions through which it may matter. It also requires demonstrating that digital context has an empirical role rather than merely appearing in the title or background.

Innovation capability supplies a potential organizational mechanism. A chief executive can direct attention toward customer needs, but the organization must be able to convert that information into experiments, products, and revised practices. Research and development, knowledge integration, and commercialization routines influence whether market understanding changes the quality of investment decisions. Governance supplies a complementary condition by defining oversight, accountability, and the information presented to decision makers. Effective oversight can challenge optimistic assumptions while allowing projects with delayed returns to continue when evidence supports them. The framework therefore joins an individual-level characteristic with an organizational mechanism and a firm-level governance condition.

The analysis asks whether marketing experience is positively associated with investment efficiency, whether innovation capability provides an indirect channel, and whether governance quality changes the strength of the association. It also examines whether reported estimates differ across digital intensity, size, and ownership. These questions distinguish direct association, mediation, and moderation. A positive relationship between marketing experience and innovation is not equivalent to demonstrating an indirect effect. Likewise, higher performance among well-governed firms does not establish that governance amplifies an executive characteristic.

Each proposition requires a corresponding model, appropriate uncertainty estimates, and a clear account of temporal ordering.

The reported design uses publicly listed nonfinancial firms within a stated 2014–2025 window. It combines executive biographies, financial disclosures, governance information, and innovation indicators in a panel framework. The supplied results contain 4,326 observations, baseline regressions, mechanism tests, subsample estimates, and robustness exercises. This revision organizes those results into five tables and interprets coefficients in their reported units. It also preserves material reporting limitations. In particular, the outcome definition and descriptive values do not reconcile, the number of distinct firms is unspecified, and the fixed-effects structure requires clarification. These issues constrain economic and causal interpretation without preventing a careful presentation of the framework and reported patterns.

The contribution is to connect marketing experience with the organizational capacity to use market information and with the governance arrangements that discipline investment judgment. This perspective extends discussion of executive expertise beyond a simple comparison between functional backgrounds. It treats marketing knowledge as potentially useful while recognizing that it can coexist with bias and that other experience remains important. For boards and managers, the relevant implication concerns the fit between leadership expertise, investment demands, and organizational support. For research, the central task is to identify when that fit produces better allocation rather than inferring efficiency from leadership labels or favorable corporate outcomes alone.

Literature Review

Upper echelons theory explains why executives' interpretations matter when organizations confront complex and uncertain environments. Hambrick and Mason connect organizational outcomes with the experiences and cognitive orientations of senior managers [1]. The theory directs attention to how strategic choices are filtered through individual understanding, especially when decision makers cannot evaluate every available fact. Functional experience provides one observable indicator of that understanding. In this study, marketing experience is treated as exposure to activities involving customers, markets, and commercialization. The proposed relationship is therefore probabilistic and contextual. A biography can indicate relevant exposure, but does not establish the executive's current beliefs, competence, or actual role in a particular investment decision.

This distinction prevents a deterministic comparison between marketing, financial, and operational leaders. Financial experience can support long-term judgment, just as marketing experience can coexist with short-term pressures. Executives frequently accumulate knowledge across several functions before becoming chief executive. Their decisions also reflect the senior team, board, organizational routines, and incentives. A meaningful analysis should consequently ask whether prior marketing responsibilities add explanatory information after accounting for other characteristics. It should not assume that a marketing background implies the absence of other expertise or that any observed difference reflects a uniquely customer-oriented personality. These qualifications are necessary for interpreting professional experience as a research variable rather than a complete description of leadership.

Agency theory addresses a different source of investment variation. Managers may make choices that depart from the interests of owners because information and control are distributed unevenly [2]. Excessive investment can expand managerial influence, while insufficient investment can protect immediate results or avoid personal risk. Governance mechanisms aim to reduce these distortions by improving oversight and aligning incentives. The separation of ownership and control also makes information quality important to accountability [10]. In the present framework, marketing knowledge can improve an executive's ability to assess an opportunity, while governance influences whether that ability is directed toward appropriate organizational objectives. Competence and incentives are related concerns, but neither can substitute for the other.

Investment-efficiency research provides empirical approaches for examining these concerns. Richardson analyzes overinvestment using an accounting framework, while Biddle, Hilary, and Verdi examine how reporting quality relates to investment efficiency [12], [13]. These studies are relevant because they distinguish investment expenditure from its alignment with opportunities and financing conditions. Their measurement logic also establishes a limitation. A deviation from predicted investment is an indicator derived from a model, not a direct observation of waste or a missed positive-value project. The present study therefore interprets residual-based measures as proxies whose meaning depends on the prediction equation and the characteristics of the estimation sample.

The marketing literature explains why market knowledge can contribute to decisions beyond communication or sales execution. Moorman and Rust examine marketing's role within the organization and connect it to processes that cross functional boundaries [6]. For an executive, this orientation can provide a basis for asking how customers perceive value and how a proposed investment supports that value. It can also connect demand information with activities such as service design, distribution, and product development. The relevant implication is organizational: useful market knowledge needs to reach the people who select and implement projects. A chief executive's prior experience is potentially influential because the position permits that knowledge to shape priorities across functions.

Market sensing is one possible mechanism, but it requires careful definition. It concerns recognizing and interpreting signals about changing demand, competitors, and customer practices. More information is not necessarily better sensing. Customer data may overrepresent existing users, conceal unmet needs, or reflect temporary responses to incentives. Marketing experience can help an executive question these limitations, but it may also encourage reliance on familiar segments and established measures. The mechanism is therefore strongest when experience supports disciplined interpretation rather than confidence alone. In the framework, better sensing reduces uncertainty about opportunities, allowing the organization to reconsider both excessive commitments and unwarranted hesitation.

Relationship knowledge provides another potential contribution. Investment returns can depend on customers, distributors, suppliers, and complementary service providers. An organization may hesitate to invest when another actor can appropriate part of the return after resources are committed. Familiarity with market relationships may help an executive structure commitments or recognize when cooperation is credible. Qiu and colleagues' analysis makes uncertainty and relational hold-up relevant to the marketing-experience relationship [11]. This paper uses that work to locate its contribution rather than claiming those mechanisms as new. Its additional emphasis concerns whether organizational innovation and governance help translate executive experience into the allocation patterns reported here.

The resource-based view provides a bridge between individual knowledge and organizational outcomes. Barney explains sustained advantage in terms of resources whose value depends on their characteristics and organizational use [3]. Marketing experience can be treated as part of managerial human capital, but its value is not established simply because it is difficult to acquire. It must contribute to a task and be supported by complementary resources. Customer information has limited strategic effect if the firm lacks engineering expertise, implementation capacity, or access to financing. The framework therefore treats executive experience and innovation capability as potentially complementary. It does not infer sustained competitive advantage from a single positive regression coefficient.

Innovation capability represents the ability to develop and use new products, services, processes, or business arrangements. The draft measures this capability through research intensity, patent applications, and digital innovation investment. These indicators capture different aspects of activity. Research expenditure records inputs, patents record particular forms of output, and digital investment records resource allocation to a broad technology category. Their combination may provide an index, but does not automatically measure commercialization success. The theory expects marketing experience to improve how such activities connect with demand. Establishing that expectation empirically requires distinguishing investment in innovation from the organizational ability to convert investment into useful outcomes.

A mediating argument follows when executive experience changes innovation capability, which then changes investment alignment. A marketing-experienced chief executive may encourage cross-functional review, clarify customer problems, and direct experimentation toward opportunities with identifiable users. These practices could improve the quality of information available for subsequent investment. However, the sequence can run in the opposite direction. Innovative firms may recruit executives with marketing backgrounds because they need commercialization expertise. They may also invest more in research before such an executive arrives. The theoretical pathway therefore requires temporal ordering and an account of selection. Contemporaneous correlations between experience, innovation, and efficiency cannot distinguish these explanations by themselves.

Dynamic capability theory adds a process perspective. Teece's account emphasizes sensing opportunities, committing resources, and transforming arrangements as conditions change [4]. Marketing experience can contribute to sensing, but strategic investment also requires evaluating alternatives and implementing decisions. The three activities can be unevenly developed. An executive may identify attractive markets while struggling to discontinue established projects, or may mobilize resources without creating routines for learning. Innovation capability offers a possible connection between these activities. The resulting explanation concerns the conversion of market understanding into repeated organizational adaptation, rather than the assertion that a particular functional background guarantees dynamic capability.

Digital transformation changes the setting in which these relationships operate. Verhoef and colleagues describe a multidisciplinary phenomenon that involves strategic and organizational changes alongside digital technologies [5]. In investment decisions, this means that technology choices can alter products, channels, information flows, and relationships simultaneously. Market experience may help evaluate these interdependencies, particularly where adoption depends on customer behavior. Nevertheless, digitally intensive industries are not identical to digitally mature firms. A company can operate in a technology sector while lacking integrated data or capable investment oversight. The study therefore distinguishes digital industry context from transformation capability and avoids treating sector membership as a complete measure of digital readiness.

Digital investments can also complicate conventional measures of efficiency. Some expenditures create reusable information, organizational knowledge, or options for future services rather than immediate cash returns. Benefits may depend on subsequent complementary investment. A model based on aggregate accounting expenditure can misclassify these activities when firms pursue different sequences of development. Conversely,

claims about intangible value can justify weakly disciplined spending. Market-oriented judgment and governance are potentially relevant precisely because uncertainty creates scope for both useful experimentation and optimistic storytelling. The framework expects them to improve the evaluation process, but does not assume that every digital project deserves continuation because its returns are difficult to measure.

Governance quality is proposed as a moderator because oversight can change how executive expertise influences decisions. Independent review may require a stronger evidence base, reduce the influence of persuasive forecasts, and clarify when projects should be revised or stopped. Institutional investors and audit structures can also influence information availability and monitoring. These mechanisms may allow a capable executive to pursue uncertain investments without removing accountability. Yet governance is not uniformly enabling. Excessively narrow targets can discourage worthwhile experimentation, while weak monitoring can permit persistent overcommitment. A positive interaction is therefore a conditional empirical proposition, not a universal claim that increasing every governance component strengthens marketing leadership.

The governance index requires particular care because its components may have different effects. Board independence, ownership concentration, institutional holdings, audit effectiveness, and chief executive duality do not share a self-evident direction. Concentrated ownership can strengthen monitoring or increase the influence of a dominant shareholder. Duality can improve coordination or weaken independent challenge. Coding these features into a higher-is-better index requires explicit theory and transparent weights. The framework uses the aggregate construct reported in the draft but recognizes that different component combinations may produce the same score. Interpretation should therefore focus on the reported association while identifying disaggregation as an important next step.

Behavioral decision theory provides a reason to consider the limits of expertise. Kahneman and Tversky show how choices under risk can depart from a simple model of consistent expected-value evaluation [8]. Applied here, functional experience may create useful knowledge while also strengthening familiar frames. An executive may overweight evidence from previous markets or continue a project associated with a favored strategic narrative. This possibility strengthens the case for governance complementarity, but it is not directly tested by the available data. The framework uses behavioral reasoning to explain why expertise should be challenged constructively, rather than interpreting experience as a measure of unbiased decision making.

Research on marketing experience and green innovation also demonstrates that innovation relationships are already part of the literature. Huang, Chang, and Zhang examine executive marketing experience, green innovation, and market-oriented culture [14]. Their work helps establish that linking experience with innovation is not, by itself, a sufficient novelty claim. The present framework instead focuses on innovation as a proposed channel to an investment-efficiency outcome and on governance as a conditioning factor. Whether that combination yields a substantive advance depends on distinguishing the constructs, explaining the digital setting, and showing empirical evidence that is not reducible to existing findings about innovation or executive backgrounds.

The integrated framework produces several expectations stated here in prose. Marketing experience is expected to be positively associated with investment efficiency because it may improve the interpretation of market opportunities and commercialization risks. Innovation capability is expected to transmit part of this relationship by converting market information into useful experimentation and project evaluation. Governance quality is expected to strengthen the association when oversight improves information and disciplines commitment. Larger estimates are also expected in settings where digital competition and organizational complexity make market interpretation especially relevant. These expectations remain distinct: evidence for a direct relationship does not establish a mediator, moderator, or statistically significant difference between subsamples.

Methods

The research adopts a quantitative panel design centered on the relationship between chief executive marketing experience and investment efficiency. Innovation capability is examined as an organizational mediator, while corporate governance quality is examined through an interaction with executive experience. The observation window is stated as 2014–2025, and the reported regressions contain 4,326 observations. The number of unique enterprises, countries, and chief executives is not given. The analysis should therefore be understood as a presentation of the study's reported estimates, subject to the measurement and specification qualifications below. No additional firm records, coefficient estimates, or hypothesis tests have been generated during this rewrite.

The population described in the draft consists of publicly listed nonfinancial firms in technology, telecommunications, e-commerce, digital services, manufacturing, healthcare technology, and other consumer-facing digital activities. Financial institutions are excluded because their accounting and regulatory arrangements differ from those of other corporations. Firms are required to have at least five consecutive years of relevant information, including executive characteristics, financial variables, governance indicators, and innovation measures. This eligibility rule can support longitudinal analysis, but also selects firms with more complete disclosure. Without a sample-selection record, the extent to which retained firms differ from excluded or less visible enterprises cannot be assessed.

Financial and governance data are attributed to Bloomberg, Thomson Reuters Eikon, Compustat, CSMAR, and annual reports. Executive biographies are attributed to company disclosures, BoardEx, public professional profiles, and governance reports. Innovation information is attributed to patents, research disclosures, and digital investment indicators. These sources may cover different jurisdictions and use different definitions. A reproducible dataset requires enterprise identifiers, source priorities, matching rules, currency conventions, and a record of conflicting entries. Their absence limits independent reconstruction. The study does not infer a particular country composition from the presence of a database in the source list, because the draft does not establish which source supplied each observation.

The source reports excluding missing observations and winsorizing continuous measures at the first and ninety-ninth percentiles. These procedures require clarification about when thresholds are calculated and which variables are affected. Pooled thresholds, country-year thresholds, and industry-year thresholds can produce different adjusted values. A binary executive-experience indicator should remain distinct from continuous variables. Missing data also need to be differentiated from genuine zeros, particularly for research spending, patents, and digital investment. Treating unavailable expenditure as zero could change both the capability index and the investment benchmark. The available text does not provide the exclusion counts or missingness pattern, so sample attrition remains a limitation.

Investment efficiency is defined through departures from an expected investment model. The draft describes expected expenditure as a function of lagged growth opportunities, operating cash flow, leverage, size, and, in its narrative, lagged investment. The displayed equation omits the last variable. For a consistent implementation, investment should have a documented expenditure definition and scaling denominator, and the prediction model should specify whether estimation occurs by industry and year. Residuals then describe investment above or below the model prediction. Their absolute magnitude can represent the size of the deviation, while the sign can distinguish relatively high from relatively low investment. These distinctions should remain visible when interpreting efficiency [12], [13].

The draft states that efficiency equals the negative absolute residual, so larger values should be closer to zero and should not exceed zero. However, its descriptive table reports a mean of 0.214 and a maximum of 0.682. Those values cannot result from the stated transformation without an additional adjustment. Possible scaling, centering, or alternative construction is not documented and cannot be inferred safely. This revision therefore retains the reported descriptive values and coefficients while labeling the outcome transformation as unresolved. Substantive direction is interpreted according to the source's higher-is-more-efficient convention, but numerical magnitudes cannot be translated into economic gains until the construction is reconciled.

The primary explanatory variable is a binary indicator of marketing experience acquired before the chief executive appointment. Eligible responsibilities include senior marketing, sales, branding, customer strategy, and market development. The alternative measure records years in relevant managerial positions. This coding captures professional exposure rather than the quality of performance in those positions. A complete protocol should distinguish substantial decision responsibility from a title containing a marketing-related word. It should also address overlapping roles, executive changes within a year, multiple appointments, and missing biographies. The source does not report coder agreement or adjudication procedures, which limits confidence in the consistency of manually collected career classifications.

Innovation capability combines research and development intensity, patent applications, and digital innovation investment through principal component analysis. Implementation requires clear definitions, comparable scaling, and a specified treatment of skewness. Patent counts may need adjustment for the timing of applications and differences between industries. Research intensity requires a denominator, and digital investment needs a coding rule that distinguishes it from total capital expenditure. The index's reported positive range suggests normalization, but the transformation is not supplied. Component loadings, retained variance, and the direction of the index are also absent. These details matter because the mediation interpretation depends on higher values representing a consistent underlying organizational capability.

Governance quality combines board independence, institutional ownership, audit committee effectiveness, executive duality, and ownership concentration. The source specifies that higher scores indicate stronger oversight but does not provide weights, component direction, or the treatment of jurisdictional differences. An index formed from governance arrangements is not necessarily a reflective psychological scale. Cronbach's alpha or composite reliability alone would therefore not establish that the index is appropriate. More relevant evidence includes coding transparency, content coverage, sensitivity to alternative weighting, and the interpretation of each component. The study retains the aggregate index while treating its precise construction as an essential item for replication.

Controls identified in the source include size, age, leverage, profitability, market-to-book measures, executive age, and executive tenure. Tobin's Q is the reported market-opportunity variable in the tables. Firm age appears in the narrative but not in the baseline coefficient table. The specification should clarify whether it is included or omitted, rather than assigning it an invented coefficient. Timing also matters: contemporaneous profitability or innovation can reflect earlier executive decisions, and some controls may lie on the pathway being

investigated. The appropriate selection should follow the causal question. Adding every available characteristic does not necessarily reduce bias and can obscure the interpretation of the relationship of interest.

Baseline estimation relates the reported efficiency outcome to marketing experience and controls. The methods describe firm and year fixed effects, whereas the result tables identify industry and year effects. These are different specifications. Firm effects account for time-invariant enterprise differences; industry effects account only for characteristics shared at the industry level. The distinction is especially important because an executive's prior experience changes mainly when leadership changes. A firm fixed-effects estimate would rely on enterprises experiencing relevant changes over time. The number of such transitions is not reported. The tables in this revision retain the original industry and year labels and identify the firm-effects description as requiring reconciliation.

The mediation design estimates the association between marketing experience and innovation, then relates efficiency to both variables. The proposed indirect effect is the product of the experience-to-innovation and innovation-to-efficiency coefficients. The source reports bootstrap assessment and a Sobel statistic, but provides no resampling count, clustering procedure, or interval endpoints. These omissions limit the assessment of uncertainty. More fundamentally, mediation requires assumptions about unmeasured confounding and temporal order. The reported equations do not establish that innovation changes after executive appointment and before efficiency. The results are consequently interpreted as consistent with a possible innovation channel, rather than proof that the channel causally transmits executive experience.

Governance moderation is examined by including marketing experience, governance quality, and their product alongside controls. A positive product coefficient indicates that the estimated association with experience increases as the governance score rises, conditional on the model. The coefficient on experience then describes the association when governance equals zero, unless the moderator has been centered. The source does not specify centering, and zero lies below the reported governance minimum. The main experience coefficient should therefore not be treated as the average effect in this model. Interpreting moderation substantively requires marginal effects over the observed range, uncertainty intervals, and an assessment of whether the conditional comparisons are supported by sufficient observations.

The study reports several approaches to selection and endogeneity. Lagged predictors establish ordering more clearly than simultaneous measures but do not remove all omitted-variable bias. Propensity score matching compares firms with similar observed characteristics, yet depends on the covariates, timing, overlap, and balance achieved. The instrumental-variable specification uses industry prevalence of marketing-experienced executives. Its relevance is reported through a first-stage statistic, but the exclusion restriction requires a separate argument because industry conditions may also influence investment directly. The study therefore treats matching and instrumental-variable results as sensitivity evidence whose credibility depends on documentation beyond the positive second-stage coefficient.

Dynamic panel estimation using generalized method of moments is also reported. Its interpretation requires the lag structure, transformation, instrument sets, number of instruments, and treatment of firm and year dependence. An insignificant second-order serial-correlation statistic is relevant, but does not establish validity of every instrument. Likewise, a Hansen statistic cannot be interpreted without knowing whether the reported number is a test statistic or a probability. Additional exercises use alternative outcomes, alternative innovation measures, crisis-year exclusion, and quantile regression. Their estimated coefficients are retained, while model-specific sample sizes and inference details are identified as missing rather than supplied through plausible assumptions.

The original abstract refers to structural equation modeling, ESG governance, and digital transformation as estimated channels or moderators. The body does not provide a structural equation model, fit statistics, a distinct ESG measure, or corresponding interaction estimates. Those claims are therefore excluded from the empirical account in this revision. Corporate governance quality remains the reported moderator, innovation remains the reported mediator, and digital intensity remains a contextual comparison. This alignment keeps the stated questions consistent with the available results. It does not establish that unreported analyses were never undertaken, but avoids presenting them as evidence without outputs that identify their variables and specifications.

The research uses secondary corporate and executive information rather than newly recruited participants. Public availability does not remove the need to consider licensing, appropriate attribution, and the treatment of personal career data. No ethics approval number, permission, or unrestricted dataset availability is inferred from the source. Before submission, the authors should provide the applicable institutional determination and explain how proprietary records can be accessed for replication. An auditable research package would include the variable dictionary, career-coding protocol, data-processing scripts, estimation code, and a source log. These materials are necessary to resolve the identified measurement issues and establish which results can be reproduced independently.

2. RESULTS

The reported evidence is organized into five tables without creating new observations or estimates. Table 1 combines descriptive measures with variance inflation factors. Table 2 presents the correlations. Table 3 retains the baseline coefficient specifications. Table 4 consolidates the innovation and governance analyses, and Table 5 combines subsample estimates with robustness and endogeneity diagnostics. This organization preserves the distinction between preliminary associations, primary regressions, mechanism tests, and sensitivity analysis. Statistics are reproduced from the draft unless identified as a direct calculation. Their interpretation remains subject to the unresolved outcome transformation, incomplete sample information, and differing fixed-effects descriptions discussed in the methods.

Table 1 Descriptive statistics and multicollinearity indicators

Variable	Mean	SD	Minimum	Maximum	VIF
Investment efficiency	0.214	0.137	−0.421	0.682	—
CEO marketing experience	0.341	0.474	0.000	1.000	1.82
Innovation capability	0.487	0.251	0.031	0.914	2.31
Governance quality	0.553	0.184	0.127	0.933	1.97
Firm size	15.287	1.924	10.241	21.377	2.54
Leverage	0.416	0.203	0.041	0.87	1.64
Profitability ROA	0.082	0.051	−0.137	0.284	1.89
Tobin Q	1.964	0.877	0.653	5.724	2.17
CEO age	53.481	6.271	38.000	71.000	1.45
CEO tenure	6.127	4.512	1.000	23.000	1.73

The experience-indicator mean of 0.341 corresponds to 34.1 percent of the observations included in the descriptive calculation being coded as marketing-experienced. It should not automatically be described as the percentage of distinct firms or unique executives, because observations may repeat organizations and individuals across years. The innovation and governance means are 0.487 and 0.553, respectively. Both show dispersion, but their scale construction remains incompletely documented. The outcome's positive mean conflicts with the negative-absolute-residual definition. Table 1 preserves this discrepancy rather than modifying the values. The reported inflation factors are low relative to commonly used screening cutoffs, although they do not assess omitted-variable bias or identification.

Table 2 Reported bivariate correlations

Variable	SIE	CME	IC	CGQ	Size	Leverage
Investment efficiency SIE	1.000	—	—	—	—	—
Marketing experience CME	0.342***	1.000	—	—	—	—
Innovation capability IC	0.468***	0.391***	1.000	—	—	—
Governance quality CGQ	0.301***	0.217***	0.354***	1.000	—	—
Firm size	0.194**	0.112*	0.228**	0.275***	1.000	—
Leverage	−0.287***	−0.103*	−0.174**	−0.158*	0.237**	1.000

Marketing experience is positively correlated with the reported efficiency measure at 0.342 and with innovation capability at 0.391. Innovation has a correlation of 0.468 with efficiency, while governance has a correlation of 0.301. Leverage is negatively associated with each of these three variables. These bivariate relationships fit the proposed directional expectations, but do not distinguish executive selection, common firm characteristics, or a temporal effect. The significance markers are retained as reported. Because the underlying calculation and dependence adjustments are unavailable, they should not be interpreted as correcting for repeated firm observations. The correlation matrix provides an initial description of covariation, rather than an independent test of mediation or moderation.

Table 3 Baseline regression estimates for reported investment efficiency

Variable	Model 1	Model 2	Model 3
Marketing experience	0.087*** (4.92)	0.081*** (4.57)	0.074*** (4.21)
Firm size	0.021** (2.16)	0.018** (2.02)	0.017* (1.94)
Leverage	−0.066*** (−3.88)	−0.061*** (−3.47)	−0.057*** (−3.19)
Profitability	0.093*** (5.04)	0.088*** (4.76)	0.083*** (4.35)
Tobin Q	0.047*** (3.11)	0.042*** (2.87)	0.039** (2.55)
CEO age	−0.009* (−1.88)	−0.008* (−1.77)	−0.007 (−1.54)
CEO tenure	0.011** (2.09)	0.010** (2.01)	0.009* (1.82)
Industry effects	Yes	Yes	Yes
Year effects	Yes	Yes	Yes
Observations	4,326	4,326	4,326
Adjusted R squared	0.371	0.392	0.417

The marketing-experience coefficients are positive across the three baseline specifications, declining from 0.087 to 0.081 and 0.074. Their reported test statistics range from 4.92 to 4.21, with significance at the one-percent level. These are differences in the units of the reported outcome, not percentage gains. In particular, 0.087 cannot be interpreted as an 8.7 percent improvement without a suitable outcome scale, comparison base, and transformation. The models share 4,326 observations and show adjusted R squared values from 0.371 to 0.417.

However, the table does not fully identify what changes between specifications, so the reason for improved fit cannot be assigned to a particular added control or modeling decision.

Profitability and Tobin's Q have positive reported coefficients across the baseline models, while leverage has a negative coefficient. Size and executive tenure are also positively associated with the outcome, although their significance becomes weaker in the third specification. Executive age is negative but not marked significant in the final column. These patterns concern conditional associations within the specified models. They do not demonstrate that reducing leverage or selecting a younger executive would independently improve investment allocation. Moreover, the size coefficient cannot be compared economically with a binary experience coefficient without understanding its scaling. The control results help describe the model but do not resolve the underlying outcome inconsistency.

Table 4 Innovation mediation and governance moderation estimates

Analysis and term	Outcome	Coefficient	t statistic
Innovation model marketing experience	Innovation capability	0.216** *	5.84
Mediation model marketing experience	Investment efficiency	0.052** *	3.17
Mediation model innovation capability	Investment efficiency	0.163** *	6.28
Reported indirect effect	Investment efficiency	0.035** *	Not supplied
Sobel assessment	Indirect relationship	Not applicable	4.97***
Governance model marketing experience	Investment efficiency	0.061** *	3.84
Governance model governance quality	Investment efficiency	0.097** *	5.12
Marketing experience × governance	Investment efficiency	0.084** *	4.67

The innovation equation reports an experience coefficient of 0.216. In the efficiency equation including innovation, the experience coefficient is 0.052 and the innovation coefficient is 0.163. Their product is approximately 0.035, consistent with the reported indirect-effect entry. The positive remaining experience coefficient is compatible with partial mediation in the fitted relationships. However, the reported claim that innovation explains approximately 39 percent of the total relationship is not reproduced because the relevant total-effect specification and confidence interval are unavailable. The Sobel statistic of 4.97 and the reported significance of the indirect effect support further examination, while the temporal and confounding requirements for causal mediation remain unresolved.

The governance model reports an experience coefficient of 0.061, a governance coefficient of 0.097, and an interaction coefficient of 0.084, all marked significant at one percent. The positive interaction is consistent with a stronger experience association at higher governance scores. The experience coefficient alone is not the average association unless the coding and centering establish that interpretation. The model's adjusted R squared is 0.446, but comparison with the baseline columns requires identical outcomes, samples, and specifications. No separate ESG or digital-transformation moderation coefficient is supplied. The available moderation evidence therefore concerns the aggregate corporate-governance index only.

Table 5 Subsample estimates robustness exercises and endogeneity diagnostics

Analysis	Group or procedure	Reported value	t statistic or qualification
Subsample	High digital intensity	0.103***	5.91
Subsample	Low digital intensity	0.044**	2.28
Subsample	Large firms	0.092***	4.84
Subsample	Small firms	0.051**	2.41
Subsample	Private firms	0.098***	5.17
Subsample	State-owned firms	0.039*	1.79
Robustness	Alternative efficiency measure	0.071***	t not supplied
Robustness	Alternative innovation measure	0.068***	t not supplied
Robustness	Propensity score matching	0.074***	Balance details absent
Robustness	Two-stage least squares	0.082***	Exclusion restriction unresolved
Robustness	System GMM	0.079***	Instrument count absent
Robustness	Crisis-year exclusion	0.069***	Excluded years unspecified
Robustness	Quantile regression	0.073***	Quantile unspecified
Diagnostic	Hansen J entry	0.417	Statistic versus p value unclear
Diagnostic	Arellano–Bond AR 1	−2.84**	Reported test statistic
Diagnostic	Arellano–Bond AR 2	−0.91	p value not supplied
Diagnostic	First-stage F statistic	24.63	Not evidence of exclusion validity

The subsample estimates are larger for highly digital industries than for less digital industries, larger firms than smaller firms, and private enterprises than state-owned enterprises. Each comparison is consistent with the

contextual argument, but separate significance within groups does not establish a significant difference between groups. Formal interaction tests, group definitions, sample sizes, and confidence intervals are needed to evaluate those claims. The table therefore reports numerical contrasts without marking the comparative hypotheses as confirmed. The robustness estimates remain positive across the listed procedures. This consistency is informative, but each procedure addresses a different concern and retains assumptions that cannot be assessed from the coefficient alone.

The diagnostic block reports a first-stage F statistic of 24.63, an AR(1) value of −2.84, and an AR(2) value of −0.91. The Hansen entry is 0.417, without a clear indication of whether it is a statistic or a probability. These values are preserved with their reporting limits. They do not justify declaring all instruments valid or excluding reverse causality. The source's result summaries are consequently interpreted as evidence of a stable positive reported association across alternative approaches, with suggestive innovation and governance relationships. Validation of the economic magnitude and identification requires the reconciled outcome construction, complete specifications, and underlying estimation outputs.

3. DISCUSSION

The central reported pattern is a positive association between executive marketing experience and the study's investment-efficiency indicator. This pattern is compatible with the idea that market knowledge can contribute to resource allocation beyond its familiar role in generating demand. An executive who understands adoption, segmentation, and customer relationships may evaluate investment assumptions more effectively. However, the study's outcome inconsistency prevents a settled interpretation of economic benefit, and executive selection remains an alternative explanation. The theoretical contribution should therefore be framed around a mechanism worth testing rather than a definitive claim that marketing-experienced chief executives universally allocate capital better than other leaders.

Upper echelons theory helps explain why professional backgrounds can influence attention. Investment proposals contain more information than a chief executive can evaluate personally, requiring judgments about which questions deserve scrutiny. Marketing experience may direct attention toward evidence of customer need, competitive response, and commercialization conditions. That influence can occur through committee agendas, reporting requirements, and appointments rather than direct involvement in every project. Future research could observe these intermediate decisions. Such evidence would strengthen the connection between an observable career variable and the cognitive process proposed by the theory. Without it, the biography remains an indicator of possible experience rather than a direct measure of market-oriented reasoning.

The findings should also be interpreted in relation to prior work. Qiu and colleagues already establish a direct research connection between marketing experience and investment efficiency [11]. Huang and colleagues examine a relationship with green innovation [14-19]. The proposed advance here is the joint consideration of innovation capability, governance, and digital context within one allocation framework. That advance is narrower than claiming an unexplored link between marketing leadership and corporate outcomes. Its value depends on explaining why the mechanisms belong together and showing that their combined interpretation offers information beyond separate positive associations. Clear positioning makes the paper's contribution more credible and provides a basis for designing comparative tests.

The innovation results suggest one route from experience to organizational decisions. Market knowledge can guide which problems receive research attention and how experiments are evaluated. A firm may avoid investing in a technically sophisticated product without an identifiable user, or may recognize that a small experiment could resolve uncertainty about an overlooked opportunity. Innovation capability is relevant because it determines whether the organization can act on those judgments. Nevertheless, the indicators used here emphasize inputs and patent activity. They do not directly measure the quality of experimentation or commercialization. The interpretation should consequently remain tied to an innovation-related index until evidence establishes the more specific routines proposed in the theory.

There is also a potential mechanical connection between innovation measures and the investment outcome. If research or digital expenditure contributes to both the capability index and the definition of total investment, part of the association may arise from shared accounting content. That does not automatically invalidate the estimates, but it changes what the mediation model can establish. Separating innovation inputs from subsequent outputs and using appropriately lagged measures would provide a clearer assessment. Researchers should document whether the outcome includes the same expenditure categories and whether the estimated expected-investment model accounts adequately for intangible intensity. These steps would help distinguish a substantive organizational channel from overlapping measurement.

Governance complementarity provides another substantive implication. Oversight need not operate only by restricting executive discretion. It can improve the information on which discretion rests, make assumptions open to challenge, and establish procedures for revising commitments. Marketing experience may supply insight about demand while governance requires that insight to be tested against financial and operational evidence. The

positive interaction is consistent with this interpretation, but the aggregate index does not identify which arrangement performs that function. Board independence, ownership structure, and audit oversight could contribute through different processes. Disaggregating them would clarify whether the relationship concerns monitoring, advice, resource access, or some combination of these roles.

The digital setting raises a particular need for disciplined learning. Rapid revisions and extensive customer data can make experimentation less costly in some settings, but they can also encourage investment in repeated pilots without an agreed path to scale or termination. Marketing-experienced leadership may help define customer evidence, while technical and financial teams assess feasibility and returns. The appropriate organizational arrangement is cross-functional rather than a substitution of marketing judgment for other expertise. The study's framework is most useful when it specifies how those perspectives interact. Its implications concern the quality of collective decision processes, not the concentration of every investment decision in a chief executive with one functional background.

A customer orientation can also have limits. Existing customers may resist unfamiliar services, and current demand may provide little guidance about an emerging technology. An executive who relies excessively on familiar market signals could underinvest in opportunities whose users have not yet formed clear preferences. Conversely, persuasive customer narratives can encourage overinvestment when market size or willingness to pay is poorly established. These possibilities show why experience should be combined with experimentation and constructive challenge. They also imply that the relationship may differ by the novelty of the investment. The supplied data do not distinguish incremental projects from more radical opportunities, leaving this boundary condition open.

The sector comparisons are compatible with a stronger role for market interpretation where adoption cycles and competitive responses change quickly. However, high digital intensity can correlate with intangible assets, growth opportunities, financing conditions, and the availability of customer information. A larger coefficient within such industries may reflect one or several of these features. Formal interaction tests and a transparent industry classification are necessary before claiming a digital amplification effect. Firm-level measures would also help because organizations within the same sector can differ markedly in digital maturity. The distinction between industry environment and organizational readiness remains central to the framework and should guide further empirical work.

Differences by size may reflect access to complementary resources. Larger enterprises can have specialized research teams, customer analytics, and governance structures that allow executive knowledge to influence a broad portfolio. Smaller firms may have greater flexibility but fewer resources to implement recognized opportunities. The reported coefficients are consistent with the former explanation, yet they do not test it. Size can also influence the quality of disclosure, investment measurement, and the likelihood of recruiting an experienced executive. A more informative analysis would examine capability complementarity directly rather than treating size as its complete proxy. That approach would identify what smaller organizations need to use relevant leadership expertise effectively.

Ownership differences require equally careful interpretation. Private and state-owned firms can differ in objectives, appointment processes, financing arrangements, and the constraints placed on executives. A lower coefficient in one group does not establish inferior managerial quality. It may reflect different investment mandates or limited within-firm variation in executive backgrounds. The draft does not identify the jurisdictional distribution of ownership categories or their coding rules. The numerical contrast is therefore a starting point for understanding managerial discretion rather than proof of a general ownership hierarchy. Future research should identify the decision rights and incentives through which ownership conditions might influence the use of marketing knowledge.

For boards, the study supports considering market-related experience as one element of leadership fit. Selection should begin with the firm's investment challenges and the expertise available in the wider team. A company evaluating unfamiliar customer markets may benefit from different experience than one facing a major financing or operational restructuring. Career labels alone are an inadequate basis for appointment. Boards should examine the executive's record of testing assumptions, allocating resources across competing opportunities, and responding to unfavorable evidence. The reported association does not justify a universal preference for marketing-experienced candidates. It motivates a more explicit assessment of how functional experience meets the demands of the role.

Investment committees can translate the framework into better questions. Proposals should identify the customer problem, the evidence supporting expected adoption, the resources needed for delivery, and the conditions under which the project would be expanded, revised, or stopped. These questions connect market knowledge with financial discipline and implementation capacity. They also make it possible to distinguish new information from the original rationale for a project. Such practices are implications derived from the theory, not interventions evaluated by the reported regressions. Their effectiveness would need separate assessment, ideally using project-level records that track decisions and outcomes across time.

Investors may also find the interaction between executive background and governance informative, but should avoid treating it as a direct signal of future returns. The study reports an association with an investment proxy, not a trading strategy or a forecast of shareholder performance. Understanding the organization requires examining how its board evaluates intangible investment, how managers report unsuccessful experiments, and whether expertise is distributed across functions. Governance disclosures can describe formal arrangements without establishing their effectiveness. The framework encourages assessing the relationship between leadership, information, and oversight rather than relying on the presence of a favorable biography or a high aggregate governance score.

The principal empirical limitation remains the outcome definition. Negative absolute residuals cannot produce the positive range shown in the descriptive table without an undocumented transformation. Resolving this issue could affect the interpretation of every coefficient and should precede substantive percentage claims. The number of firms, executive transitions, and countries is also missing, while firm and industry effects are described inconsistently. These omissions matter particularly for a career-based predictor that changes infrequently within firms. A transparent reconstruction should show how many observations identify changes in experience and whether results persist when comparing firms under alternative fixed-effects structures. Without this information, claims of causal leadership effects remain premature.

Endogeneity exercises add information but do not eliminate the need for an identification argument. Matching depends on observed covariates and cannot remove selection on unmeasured executive ability or organizational strategy. Industry prevalence may predict appointment patterns while also reflecting market conditions that affect investment. Dynamic panel estimation depends on its own moment conditions and instrument design. Reporting positive coefficients across these methods does not establish that their assumptions all hold. The appropriate conclusion is that the supplied results show consistency across reported approaches, while the basis for stronger causal inference requires further documentation. Such precision improves the paper's credibility more than treating robustness as a checklist of favorable outcomes.

Future research should connect executive appointments, capability development, and investment outcomes through a clearly ordered design. Career coding can be strengthened through independent review and explicit rules for mixed functional roles. Innovation measurement can distinguish inputs, organizational routines, and commercialization outputs. Governance analysis can examine particular mechanisms and report marginal effects across their observed range. Separate overinvestment and underinvestment tests would clarify which allocation problem is most relevant. Comparative designs should also examine whether marketing experience adds value to other expertise rather than setting functional categories against each other. Together, these steps would turn the integrated framework into a more precise account of when executive knowledge improves investment judgment.

4. CONCLUSION

This study examines chief executive marketing experience as a potential contributor to investment efficiency in digital industries. Its framework connects executive interpretation with organizational innovation capability and corporate governance. The reported estimates show a positive experience association across baseline models, an innovation-related indirect pattern, and a positive governance interaction. Subsample and robustness estimates are directionally consistent with that account. These findings motivate a view of marketing knowledge that includes the evaluation and coordination of investment rather than focusing exclusively on growth. They also position the study as an extension of existing research, with its intended contribution residing in the integration of organizational mechanisms and contextual conditions.

The theoretical interpretation emphasizes complementarity. Executive experience can improve the questions asked about customers and commercialization, while innovation capability determines whether the organization can learn from those questions and act on the answers. Governance can support that process by challenging assumptions and maintaining accountability under uncertainty. These relationships do not imply that one professional background is universally superior or that all governance arrangements have the same effect. Their relevance depends on the investment problem, the expertise available across the organization, and the extent to which information is translated into disciplined collective decisions. This contextual interpretation provides a more useful basis for executive selection and investment oversight than a simple functional ranking.

The empirical conclusions remain bounded by the available documentation. The stated investment-efficiency transformation conflicts with reported descriptive values, fixed-effects descriptions differ, and key sample and inference details are missing. These issues must be resolved before economic magnitudes or causal effects can be established. Future research should provide auditable data construction, clear temporal sequencing, disaggregated governance measures, and separate tests of overinvestment and underinvestment. The practical lesson is to evaluate how leadership expertise works with organizational capability and oversight. Sustainable investment quality depends on that interaction being demonstrated through transparent evidence rather than assumed from executive titles or favorable coefficients.

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