

Transformational Leadership and Employee Empowerment in High-Tech Enterprises: Mechanisms, Pitfalls, and Optimization Paths

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Abstract. High-tech enterprises engage in continuous innovation led by knowledge workers, and thus, the leader's style is a strategic factor rather than a matter of administration. This paper studies transformational leadership (TFL) and innovation in high-tech enterprises. Based on the synthesis of meta-analytic results and recent studies of Chinese high-tech enterprises, this paper builds a two-layer empowerment framework where TFL functions via a structural path (decision-right delegation, information transparency and incentive institutions) and a psychological mechanism focused on psychological empowerment and intrinsic motivation. The four propositions link TFL to strategic renewal, technological innovation, talent retention and organizational effectiveness, and they are supported by documentary case studies of NVIDIA and Huawei. Then four pitfalls were identified: symbolic adoption, follower dependency, hollowed-out consideration under extreme overtime conditions, and ethical spillover through the empowerment path. This paper therefore proposes the following four "bounded empowerment" optimization paths, and for each empowerment lever, an explicit boundary condition is set. This paper provides all-encompassing and dialectical explanations for when, how, and to what extent transformational leadership drives innovation in a high-tech environment.

Keywords: transformational leadership, psychological empowerment, high-tech enterprises, employee innovation, talent retention.

1. Introduction

Competition in the digital and artificial-intelligence (AI) era has significantly shortened the life cycle of technology, and thus, research-and-development (R&D)-intensive or "high-tech" enterprises must continuously innovate to survive. The main staff of such companies are knowledge workers; their contribution relies on their own creative ideas rather than following instructions, and they do not respond well to top-down management. Thus, the leadership model limits the capacity for innovation; research on digital transformation has identified leadership as a first-order supporting factor alongside strategy and organizational agility [1], and recent surveys of Chinese high-tech enterprises have shown that leaders' behavior affects the environment where knowledge workers conduct innovative behavior [2]. The extent of the problem is shown by the resource allocation of leading enterprises; for example, Huawei has invested 179.7 billion Chinese yuan (CNY), or 20.8% of its 2024 revenue, in research and development and employed more than half of its staff in research [3]. Leaders' utilization of these resources and talent in continuous innovation is also a problem for scholars and managers at high-tech companies.

Among the leadership constructs, transformational leadership (TFL), which includes idealized influence, inspirational motivation, intellectual stimulation and individualized consideration [4], has been studied most extensively in the context of innovation. The gathered evidence carries a harsher message than praise. A meta-analysis of 127 studies showed that although TFL has a positive overall effect on employees' creativity, when a mediation model is applied [5], the direct effect is negative; therefore, the innovation effect of TFL is achieved almost entirely through motivational paths and not through leader charisma directly. Psychological empowerment has become the main route. Meta-analytic evidence shows that leadership is one of the stronger contextual antecedents of psychological empowerment; furthermore, higher levels of empowerment are associated with greater satisfaction,

commitment and performance, and lower strain and turnover intention [6], and a comparative meta-analysis indicates that transformational, empowering and servant leadership contribute almost equally to psychological empowerment [7]. Therefore, the live research question has shifted from whether TFL is necessary to how empowerment mechanisms should be designed and to what extent. Three deficiencies remain. First of all, “empowerment” can refer to both the system of organization and people’s sense of ability. Second, mechanism-level evidence specific to high-tech environments is not integrated in a single study. Third, boundary conditions such as follower dependence, cultural friction and ethical risks are rarely included in prescriptive accounts, even though the construct itself has received measurement-level criticism [8].

Based on the above deficiencies, this paper presents an integrated review and two case studies. It asks four questions: why do high-tech enterprises specifically need, and test, transformational leadership; through which empowerment mechanisms does TFL work; when do these mechanisms backfire; and how can high-tech enterprises optimize leadership practice. Based on meta-analyses, recent empirical studies of Chinese high-tech enterprises, and public documentary materials concerning NVIDIA and Huawei, this paper selects case materials for illustration rather than verification, and as the underlying evidence base is predominantly associational, causal language has been deliberately avoided throughout. First, the paper introduces a two-layer empowerment framework that distinguishes between structural transmission and psychological experience; second, it puts forward four propositions supported by meta-analysis and Chinese high-tech evidence; finally, it proposes a set of “bounded empowerment” optimization paths that treat the pitfalls of empowerment as design constraints rather than treating them as problems after the fact. Section 2 builds the framework, Section 3 establishes contextual fit, Section 4 presents mechanisms and cases, Section 5 analyzes pitfalls, Section 6 derives optimization paths, and Section 7 concludes.

2. Conceptual Foundations and Analytical Framework

2.1. Transformational leadership

Transformational leadership refers to a kind of behavior in which leaders inspire followers to attain high goals and perform better than expected under a transactional system; generally, the four components of transformational leadership are idealized influence (behaving as a respected role model), inspirational motivation (presenting an uplifting vision), intellectual stimulation (questioning norms and promoting new ideas), and individualized consideration (addressing the individual development needs of each person) [4]. As the four dimensions are highly correlated in terms of measurement and their empirical separability remains debated [8], this paper considers them analytical lenses for a unified behavior rather than four independent causes. In recent years, Chinese scholars have built a local structure of transformational leadership that differentiates moral modeling—that is, leading by virtuous example—as an independent trait alongside charisma, vision and individualized consideration [9]; this localization is also applicable to Chinese high-tech enterprises and reappears in the discussion of ethical boundaries (Section 6.4).

2.2. Empowerment: a two-layer definition

Two related but different ideas are in the empowerment literature. Structural empowerment refers to the institutional design of organizations that distributes decision-making powers, information and resources downward. The four cognitive components of the experienced motivational state in psychological empowerment are meaning, competence, self-determination and impact [10]. The two layers are causally related but not interchangeable, and the division of power will affect the employees’ sense of empowerment. Research on empowering leadership has shown the full chain: in a large Chinese information-technology (IT) company, empowering leader behaviors were associated with psychological empowerment, which in turn promoted intrinsic motivation and creative process engagement, and thus enhanced creativity [11]; at the same time, the near-equivalent effects of transformational, empowering, and servant styles on psychological empowerment [7] suggest that

what truly matters is whether specific behaviors and structures help employees experience empowerment. Therefore, this paper defines an empowerment mechanism as the combination of a structural transmission channel and a psychological mechanism, and employs this two-layer definition consistently in the text. The difference is not just in concept; firms can and do separate the layers, announce empowerment, but withhold decision-making authority, and this separation is one of the reasons for the failures examined in Section 5.

2.3. Motivational engine: self-determination theory

Self-determination theory (SDT) explains why empowerment leads to innovation: meeting the basic needs of autonomy, competence and relatedness motivates people intrinsically, and this kind of motivation is more likely to lead to exploratory, discretionary effort [12]. Innovation in high-tech work is precisely such discretionary behavior: an engineer can meet all the formal requirements while refraining from the exploratory effort that produces new solutions, and no monitoring system can force what is, by definition, voluntary. Leadership that meets the three needs thus achieves a level of performance that supervision cannot. In light of this, a recent SDT-based meta-analysis of 432 independent studies ($N = 161,599$), which included 229 Chinese-language studies, found that transformational and other constructive leadership styles are positively associated with employees' creative performance, and cultural and measurement factors moderate these relationships [12]—indicating that the motivational account can be generalized to the Chinese workforce while retaining boundary conditions.

2.4. Analytical framework

Fig. 1 shows the above. Transformational leadership behavior works through a structural empowerment path (decision-right delegation, information transparency, incentive institutions) and a psychological mechanism (psychological empowerment and intrinsic motivation) to achieve three sets of outcomes: innovation performance, knowledge-worker retention, and organizational effectiveness. Contextual factors modify the strength of these paths, and the two boundary rails of calibration and ethical guardrails determine whether empowerment achieves its desired goals. Given that mediators have been added, the framework is now mediation-dominant; TFL's direct effect on creativity turns negative, as shown in a meta-analysis [5]. Table 1 shows the constructs.

Table 1. Core constructs used in this paper.

Construct	Definition	Source
Idealized influence	Leader acts as a trusted, admired role model	[4]
Inspirational motivation	Leader articulates an energizing collective vision	[4]
Intellectual stimulation	Leader challenges assumptions and invites re-thinking	[4]
Individualized consideration	Leader attends to individual development needs	[4]
Moral modeling (Chinese TFL)	Leading through virtuous personal example	[9]
Psychological empowerment	Experienced meaning, competence, self-determination, and impact	[10]
Structural empowerment (this paper)	Institutionalized delegation of decision rights, information, and incentives	Section 2.2
Empowerment mechanism (this paper)	Structural transmission channel + psychological mechanism	Section 2.2

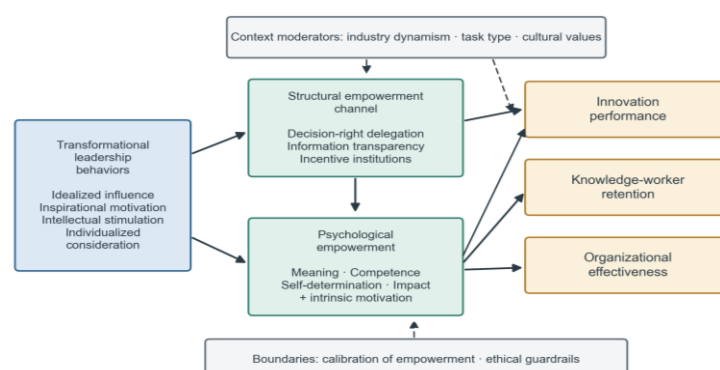


Figure 1. A two-layer empowerment framework linking transformational leadership to innovation-related outcomes in high-tech enterprises.

3. Why High-Tech Enterprises Need—and Test—Transformational Leadership

The three features of a high-tech enterprise directly correspond to the functions of transformational leadership. First, the compressed technology cycle and high environmental uncertainty create a continuous demand for credible direction-setting and change legitimacy, the province of inspirational motivation and idealized influence. Second, knowledge intensity means that output depends on employees' voluntary creative engagement under the condition of intellectual stimulation and psychological empowerment. Third, scarce and mobile technical talents are prone to leaving; thus, personalized care and development are required.

Each feature also increases the cost of getting the leadership wrong. Under compressed cycles, decision latency is also a competitive factor; if all consequential choices need to go up and down the hierarchy, the technology window will close before the decision returns, and thus, structural empowerment—moving decision rights closer to the information source—needs to be used to supplement the motivational effect of a leadership style. In a high-knowledge-intensity environment, output quality is difficult to monitor; therefore, people must be self-motivated to produce, and leadership that raises intrinsic motivation can replace supervisory models unable to address creative work. And under talent mobility, every departure is the loss of tacit knowledge accumulated over years, and retention has thus shifted from an HR indicator to an indicator of innovation capacity.

Recently, Chinese studies have also shown such contextual fit at many levels. Among 441 knowledge workers in ten Chinese high-tech enterprises, transformational leadership was positively correlated with innovative behavior through an organizational innovation climate [2]. At the firm level, among 98 Chinese high-tech companies, chief executive officer (CEO) transformational leadership was associated with a lower voluntary turnover rate and more innovative behavior among employees under a collaborative Human Resource Management (HRM) system [13]. Transformational leadership was positively correlated with product and process innovation through the mediator of knowledge-management capability among 75 Chinese manufacturing and service enterprises [14]. Case materials add texture: NVIDIA's founder-CEO has designed an unusually flat information architecture, which he explicitly describes as a design for organizational agility and employee empowerment [15], and Huawei has institutionalized long-horizon innovation through sustained R&D investment accounting for more than one-fifth of its revenue [3].

Contextual fit is not the same as general applicability. The same meta-analytic data that support TFL's relevance also show that its direct effect on creativity is negative after accounting for mechanisms [5]. Transformational leadership will help a high-tech enterprise only if its empowerment mechanisms are effective, which will be the subject of the following section, and only if the boundary conditions in Section 5 are met.

4. Empowerment Mechanisms: Propositions and Case Evidence

Four propositions (P1–P4) are developed in this section, each linking a function of transformational leadership with an empowerment mechanism and an outcome family from Fig. 1. Each proposition is supported by a minimum of one meta-analysis and one high-tech or Chinese-sample study; although documentary evidence from NVIDIA and Huawei is provided, it does not test the propositions. Table 2 shows the evidence configuration, and Table 3 compares the two cases.

4.1. Vision-led empowerment and strategic renewal

Proposition 1 (P1). Transformational leadership is positively associated with employees' commitment to strategic renewal, transmitted primarily through the meaning dimension of psychological empowerment.

Vision articulation and role modeling make organizational change personally meaningful by engaging the meaning cognition of psychological empowerment [10], and meta-analytic path evidence shows that identification- and motivation-type mediators carry the association between TFL and creative outcomes [5]. Research on digitalization has found that transformational leadership with

digital aims is associated with successful transformation through organizational agility [1]. The case materials show two types. At NVIDIA, the motto is “the mission is the boss”; therefore, task forces have been established around missions rather than reporting lines to give more attention and talent to critical missions, bypassing the typical hierarchical mode [15]. At Huawei, two decades of high-intensity, public R&D investment (accounting for 20.8% of 2024 revenue) have given employees a stable, long-term direction that is not subject to a single product cycle [3].

4.2. Stimulation-led empowerment and technological innovation

Proposition 2 (P2). Transformational leadership is positively associated with technological innovation through psychological empowerment and intrinsic motivation.

This is the field’s best-documented chain. Empowering leader behavior was positively associated with creativity through psychological empowerment and intrinsic motivation at a large Chinese IT company [11]. Knowledge-side variants replicate the logic: transformational leadership is related to product and process innovation through the mediation of knowledge management ability [14], and it is also related to the innovative behavior of knowledge workers through an innovation climate [2]—this is consistent with the meta-analysis finding that mediating mechanisms, rather than direct charisma, carry the creativity effect [5]. NVIDIA’s actions are examples of institutionalized intellectual stimulation: problems are tackled from first principles on whiteboards, and the “Top-5-Things” routine encourages employees at all levels to send up five important observations that the CEO then reads in broad daily samples, thus turning stimulation into a permanent information flow for the employees’ sense of impact [15, 16].

4.3. Care-led empowerment and knowledge-worker retention

Proposition 3 (P3). Transformational leadership is positively associated with knowledge-worker retention through psychological empowerment and basic-need satisfaction.

Psychological empowerment is associated with lower strain and turnover intention, and higher commitment (meta-analysis [6]); SDT proposes that this is achieved through internalization when autonomy, competence, and relatedness are met [12]. Firm-level Chinese evidence closes the loop: Among 98 high-tech enterprises, the CEO’s transformational leadership correlated with a lower rate of voluntary turnover through collaborative HRM [13]. The above cases suggest that in large high-tech enterprises, “individualized consideration” is partly institutionalized rather than solely dyadic; Huawei’s career and incentive system for its 113,000 R&D staff operates as organization-level consideration [3], and NVIDIA’s radical information equality functions as an inclusion signal that all employees are equally worthy of the strategic context [15].

4.4. Collectively anchored empowerment and organizational effectiveness

Proposition 4 (P4). Transformational leadership is positively associated with organizational innovation effectiveness through collective empowerment arrangements and aligned incentives.

As several constructive styles lead to a similar degree of psychological empowerment [7], prolonged group effects are less likely to be caused by a single leader’s style and more likely to result from team-level arrangements of empowerment. A Chinese meta-analysis shows that constructive leadership is positively correlated with employees’ creative performance in a large number of studies [12]. Huawei’s operating institutions have collective anchoring. According to the management philosophy, “let those who can hear the gunfire call for artillery”, deal-level decision rights have been moved to front-line customer teams, and headquarters now serves as a resource platform; at the same time, the value distribution model is designed to reward long-term collective contributions [17], and an employee shareholding system and rotating-chair governance have been introduced to share both rewards and top-level authority [3].

4.5. Evidence summary and case synthesis

Table 2 presents the evidence configurations for the four propositions, and Table 3 shows how the two cases realize the two layers of the framework.

Table 2. Propositions (P1–P4) and supporting evidence.

Proposition	Mechanism layer	Meta-analytic support	High-tech / Chinese evidence	Case illustration
P1 Vision → strategic renewal	Meaning (psychological)	[5]	[1]	NVIDIA “mission is the boss” [15]; Huawei R&D commitment [3]
P2 Stimulation → technological innovation	Psychological empowerment + intrinsic motivation	[5]	[11], [14], [2]	NVIDIA whiteboards and Top-5-Things flow [15, 16]
P3 Consideration → talent retention	Psychological empowerment → commitment/retention	[6]	[13]	Huawei R&D career system [3]; NVIDIA information equality [15]
P4 Collective motivation → organizational effectiveness	Collective empowerment + incentive alignment	[7]	[12]	Huawei front-line decision rights and profit sharing [3, 17]

Table 3. Two illustrative cases (documentary evidence).

Dimension	NVIDIA	Huawei
Salient TFL functions	Intellectual stimulation; inspirational motivation; individualized consideration enacted unconventionally (information equality instead of one-on-ones)	Inspirational motivation; idealized influence with moral-modeling features; crisis-framed vision
Structural channel	Flat top structure (about 60 direct reports in recent accounts, without regular one-on-ones); Top-5-Things information transparency; mission-based task assembly [15, 16]	Front-line decision rights (“call for artillery” principle) [17]; rotating-chair governance; employee shareholding; 20.8% R&D intensity [3]
Psychological mechanism (interpretation)	Meaning and impact via mission logic and strategic context shared with all employees	Meaning via long-horizon mission narratives; impact via delegated deal authority
Observable indicators	Sustained leadership of AI-computing platforms; extreme organizational flatness	113,000 R&D staff (54.1% of workforce); sustained R&D intensity above 20% [3]
Source caveats	Book and press sources; founder-centric intensity; survivorship risk	Company-published sources; high-pressure culture coexists with empowerment institutions

A warning applies to the whole section: mapping the four TFL functions onto four mechanisms is an analytical device; the dimensions covary strongly in practice and should not be regarded as independently adjustable levers [8].

5. Pitfalls: When Empowerment Backfires

5.1. Dependency and ethical spillover

The above-mentioned mechanisms are conduits, and conduits carry whatever the leaders place on them. Two failure modes are well-known. First, the same transformational behaviors that empower can also create dependency: In a study of 888 bank employees, transformational leadership was associated simultaneously with followers’ empowerment and their dependence on the leader, via different identification processes [18]. Dependency reverses the desired outcome: followers wait for direction in areas where independent exploration is required, and the organization is thus subject to a single leader’s judgment. The cost is highest in the very place where transformational leadership is most celebrated: the R&D environment, where dependent teams fail to generate the divergent choices needed for exploration, and a single leader’s blind spots spread across all projects under their authority. Admiration can, in other words, quietly return the empowerment architecture to a single-brain system. Second, and more worryingly for an empowerment account, the psychological-empowerment channel itself can be used for misconduct. A three-wave survey of 441 Chinese employees found that transformational leadership was positively related to unethical pro-organizational behavior (rule-breaking aimed at benefiting the company), and this relationship was mediated by psychological empowerment; at the same time, power distance moderated the first stage [19]. Empowered employees who have been motivated by an inspiring cause may be less scrupulous about ethics in service of the company; thus, the empowerment channel does not filter this flow.

5.2. Cultural and institutional frictions

Context also provides the boundaries. A Chinese meta-analysis of 432 studies found that leadership–creativity associations are moderated by cultural orientation and by measurement and publication-language factors [12], so Western models should not be directly applied. A firmer institutional boundary concerns working hours. Individualized consideration loses its meaning when extreme overtime becomes the norm; under a “996” schedule (9 a.m.–9 p.m., six days a week), developmental “care” reduces to talk. The boundary is now legally clear in China; for example, in typical cases jointly issued in 2021, the Ministry of Human Resources and Social Security and the Supreme People’s Court declared that 996-style schedules seriously violate the statutory working-hour limits [20]. A transformational narrative cannot exist credibly alongside institutionalized illegality.

5.3. Roots of the pitfalls

Combining Sections 4 and 5, four roots are repeated. First, symbolic adoption: Leaders use the language of transformation but do not change behavior, creating slogan-level reform projects. Secondly, short-termism: Quarterly pressure reduces the investment in development that individualized consideration needs. Thirdly, structural–psychological decoupling: The company announces empowerment but does not grant corresponding decision-making power, information or incentives; thus, no actual empowerment occurs. Fourth, incentive misalignment: The reward system is contrary to the goal of innovation. Fig. 2 shows the above pitfalls and the optimization paths below.

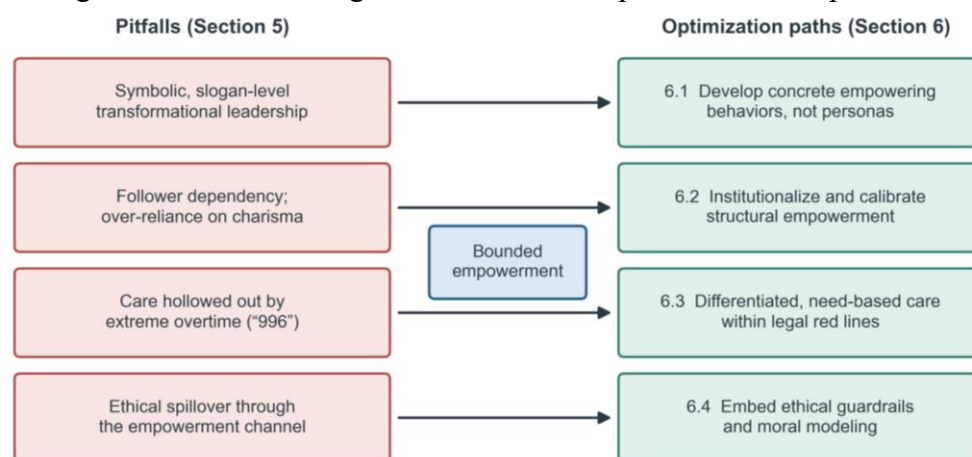


Figure 2. Pitfalls and the corresponding bounded-empowerment optimization paths.

6. Optimization Paths: Bounded Empowerment

The optimization logic is thus as follows: Each empowerment lever is associated with an explicit boundary condition, and bounded empowerment is achieved rather than maximal empowerment.

6.1. Develop concrete empowering behaviors, not personas

As transformational, empowering, and servant leadership styles contribute almost equally to psychological empowerment [7], the focus of leadership development should be on the concrete behavior bundle that all three share—articulating a vision, delegating with support, providing learning-oriented feedback, and recognizing contributions—rather than pursuing personality transformation. High-tech enterprises can add the above behavior indicators to the management appraisal and promotion system, and, for instance, require managers to present a clear team-level technology vision, document a delegation decision, and provide evidence of development feedback in each performance review cycle. The boundary condition addresses symbolic adoption: The standard for success is follower-perceived behavior, as measured by upward or multi-source feedback, rather than leader self-report, and thus prevents performative transformational leadership.

6.2. Institutionalize and calibrate structural empowerment

Empowerment that exists only in the leader's behavior will disappear after the leader leaves; enduring empowerment is institutional. Huawei codifies front-line decision rights—"calling for artillery"—with headquarters as a resource platform [17], and NVIDIA's Top-5-Things routine institutionalizes upward information flow and shared strategic context [15, 16]. Two calibrations restrict this path. First, delegate according to the readiness of employees and the programmability of tasks: a senior platform team can directly undertake architecture decisions, but a new team may first be given bounded authority with clear escalation paths. Second, the leader should observe for dependency signals; a team that cannot decide without the leader is showing empowerment in form but not in practice [18]. Delegation with resource support is empowerment; delegation without it is abdication.

6.3. Differentiate care for knowledge workers within legal red lines

Retention comes from need satisfaction, not from benefits alone. SDT-based design offers knowledge workers autonomy in task approach, competence through challenging growth paths, and relatedness via stable team structures [12]; a dual technical–managerial ladder is the typical structural manifestation, allowing senior engineers to obtain status and compensation without leaving technical work, so that promotion does not reduce the very competence the firm needs; the empowerment–commitment–retention chain is meta-analytically supported [6] and observable at the firm level in Chinese high-tech companies [13]. The boundary condition is legal: compliance with working-hour limits is the minimum requirement for any claim of individualized consideration [20].

6.4. Embed ethical guardrails in the empowerment channel

Finally, since the empowerment channel can spread unethical pro-organizational behavior [19], all empowerment levers need a values counterweight: explicit compliance boundaries on delegated discretion (what an empowered team may never trade away, such as safety, data integrity, or regulatory obligations), ethical review embedded in objective setting rather than added later, and leaders who model restraint as visibly as they model ambition—declining attractive shortcuts publicly so that empowered employees learn what the mission does not endorse. Indigenous Chinese thought on transformational leadership, which considers moral modeling a distinct dimension of leadership [9], offers a cultural foundation; thus, in Chinese high-tech enterprises, the virtuous example of the leader should be incorporated into the safe empowerment process.

7. Conclusion

How does transformational leadership promote innovation in high-tech enterprises? Based on the meta-analytic results, recent Chinese high-tech studies and the two documentary cases, the mechanism-centered answer is that transformational leadership works through a two-layer empowerment architecture: structural channels that delegate decision rights, information and incentives, and psychological mechanisms focused on empowerment and intrinsic motivation, rather than directly through charisma. The four propositions specified the above architecture for strategic renewal, technological innovation, talent retention and organizational effectiveness, with NVIDIA and Huawei presenting information-based and institution-based empowerment forms, respectively. The same evidence base, however, also documents real pitfalls—such as dependency, ethical spillover through the empowerment channel itself, cultural frictions, and care hollowed out by unlawful overtime regimes—and thus motivates four bounded-empowerment optimization paths that pair every lever with a boundary condition.

The three practical tests for the manager of a high-tech enterprise are as follows. The structural test determines whether the employees have real decision-making powers, information access and incentive stakes, or whether empowerment is limited to words. The experience test examines whether employees actually experience meaning, competence, self-determination and impact; psychological

empowerment is measurable, and its absence indicates that the structural channel has been blocked. The boundary test checks if all empowerment practices have stated calibration rules and ethical guardrails. A company that meets the above three criteria has turned transformational leadership into a firm-wide capability, which is also the practical form of bounded empowerment.

The three limitations are as follows: The case material is documentary and illustrative, not confirmatory; it lacks direct experimental evidence, and because the evidence is largely associational, no causal conclusions can be drawn. Additionally, the construct of transformational leadership at the measurement level has not been fully verified, which is why the four dimensions served as analytical lenses throughout the study. Future research can apply the two-layer framework to team-sampled, multi-source designs in high-tech enterprises, and extend it further to emerging digital and AI-mediated leadership environments; digitally oriented transformational leadership is likely to be the next focus of study.

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