LEX LOCALIS - JOURNAL OF LOCAL SELF-GOVERNMENT
Vol. 23, No. 9, pp. 1-26, September 2025

The Impact of Technical and Product Management on Smartwatch Adoption: A Qualitative Analysis of the Role of Management Innovation

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Abstract This study investigates how technical management and product management influence the adoption of smartwatches in Shenzhen, China, emphasizing the mediating role of management innovation. Situated in one of the world ' s most dynamic technology hubs, the research explores the strategic interplay between engineering, product development, and organizational innovation within the region ' s competitive smartwatch industry. Drawing on an interpretive qualitative approach, data were collected through in-depth interviews with 26 senior managers, product strategists, and technical experts across leading smartwatch firms. Thematic analysis revealed three overarching themes: (1) the strategic alignment of technological capabilities with market demands, (2) innovation as a systemic organizational capability, and (3) management innovation as a dynamic integrator linking technical potential to market impact. Findings show that successful smartwatch adoption depends not only on technical excellence or market insight but on the ability of firms to bridge these domains through agile management structures, cross-functional collaboration, and open innovation practices. Management innovation emerges as a pivotal enabler of organizational ambidexterity, allowing firms to

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doi:10.52152/23.9.729-749(2025)
ISSN 1581-5374 Print/1855-363X Online © 2025 Lex localis
Available online at http://journal.lex-localis.press

balance exploration and exploitation while maintaining responsiveness to consumer trends. The study extends theories of innovation management by demonstrating how internal cultural shifts, structural redesign, and leadership practices support product adoption in fast-paced, resource-constrained environments. Implications for future research, policy, and managerial practice are discussed, offering insights into how emerging-market firms can foster sustainable innovation through adaptive and integrative management approaches.

Keywords: smartwatch adoption, technical management, product management, management innovation, qualitative research

1 Introduction

The smartwatch industry has experienced unprecedented growth globally, characterized by rapid technological innovation and evolving consumer preferences (Guo et al., 2019; Zhang et al., 2023). Among global innovation hubs, Shenzhen, often referred to as China's "Silicon Valley," stands out prominently due to its unique integration of advanced manufacturing infrastructure, extensive research and development capabilities, and a highly competitive technological ecosystem (Liu et al., 2024; Wang et al., 2023). In recent years, the market value of smartwatches has surged significantly, driven by consumer demand for multifunctional devices that blend traditional timekeeping with sophisticated health monitoring, communication, and personal productivity features (Kim & Shin, 2015; Manini et al., 2024). The global smartwatch market reached a substantial valuation of approximately \$42.7 billion in 2023, with Shenzhen playing a critical role as both a major producer and innovator within this rapidly expanding industry (Zhang et al., 2023).

Shenzhen's success in the smartwatch industry can largely be attributed to effective technical management practices and strategic product management (Li et al., 2023; Chen & Yang, 2024). Technical management encompasses rigorous control over manufacturing processes, technological innovation, quality assurance, and the integration of cutting-edge features such as advanced sensor technology, efficient battery management, and sophisticated software capabilities (Wang et al., 2023; Malatji et al., 2020; Yang, 2020). Effective technical management ensures smartwatch products meet stringent international quality standards, adapt quickly to technological advancements, and thus significantly influence consumer satisfaction and market adoption rates (Widya & Alfarisi, 2020; Dai et al., 2021).

Parallel to technical management, product management is equally crucial in navigating a highly dynamic market characterized by rapidly shifting consumer preferences. Effective product management involves comprehensive market research, strategic product positioning, proactive lifecycle management, and alignment of product features with evolving consumer demands (Cooper, 2019; Chen & Liu, 2024). Product managers in Shenzhen must continuously anticipate and respond to market changes to ensure smartwatch products maintain relevance and competitive advantages, leveraging user insights and adopting agile methodologies (Chen & Yang, 2024).

However, despite notable advancements and significant market penetration, persistent challenges remain, particularly regarding the harmonization of rapid technological innovation with consistent product quality and responsiveness to consumer expectations (Chen & Liu, 2024; Li et al., 2023). Firms often face difficulties in integrating swift technological advancements into coherent product strategies, leading to discrepancies between product capabilities and consumer expectations, potentially hindering market acceptance and sustained product adoption (Zhou et al., 2024; Anderson et al., 2024). Moreover, organizational barriers, such as resistance to change and insufficient cross-functional collaboration, pose additional challenges to maintaining continuous

innovation momentum, underscoring the need for innovative management approaches (Tidd & Bessant, 2018; Zhou et al., 2024).

Recognizing these complexities, management innovation has garnered considerable attention as a potential mediator linking technical capabilities and product management effectiveness. Management innovation involves introducing novel management practices, processes, or structures aimed at enhancing organizational efficiency, adaptability, and overall effectiveness (Tidd & Bessant, 2018; Anderson et al., 2024). Within Shenzhen's smartwatch industry, management innovation serves as a pivotal intermediary, enabling companies to effectively synchronize technological advancements with strategic market positioning, thus aligning product development closely with consumer expectations (Zhou et al., 2024).

Given the intricate relationships among technical management, product management, and management innovation, traditional quantitative analyses alone are insufficient to fully capture the nuanced experiences and strategic decisions made within organizations (Levitt, 2019). Therefore, this qualitative study aims to explore the complex dynamics underlying smartwatch adoption in Shenzhen by emphasizing the mediating role of management innovation. By employing an interpretative qualitative approach, this research provides an in-depth exploration of stakeholder experiences, strategies, and perceptions within this vibrant technological ecosystem. Qualitative methods are particularly suited to capturing the intricate interplay of technological innovation, consumer behavior, strategic decision-making, and organizational dynamics, aspects often overlooked by purely quantitative analyses (Levitt, 2019).

Through detailed thematic analysis of interviews conducted with senior managers, technical experts, and product strategists within leading smartwatch companies in Shenzhen, this study contributes novel insights into how organizations effectively manage technological innovation, align product strategies with market demands, and implement innovative management practices to foster sustained product adoption. Ultimately, the research seeks not only to illuminate the factors influencing successful smartwatch adoption but also to inform strategic management practices and future innovation policy within Shenzhen's rapidly evolving technological landscape (Liu et al., 2024; Zhou et al., 2024).

Literature Review

The literature on smartwatch adoption is growing in parallel with the rapid expansion of wearable technology markets. Scholars across disciplines — including innovation management, product development, organizational behavior, and technology strategy — have investigated how firms navigate the complex process of bringing high-tech consumer products to market. In the context of Shenzhen ' s smartwatch industry, three interconnected constructs warrant detailed examination: technical management, product management, and

management innovation. The present review synthesizes key theoretical and empirical findings to establish a conceptual framework for this study.

Technical Management and Smartwatch Innovation

Technical management plays a foundational role in the development of technology-intensive products like smartwatches. It refers to the strategic coordination of engineering, research and development (R\&D), quality control, and production operations aimed at achieving organizational objectives (Malatji et al., 2020; Yang, 2020). In the consumer electronics sector, where competition is fierce and product lifecycles are short, effective technical management is crucial for ensuring technological superiority, operational efficiency, and product quality (Wang et al., 2023).

In the case of Shenzhen, firms often leverage a unique ecosystem that supports rapid prototyping, vertical integration, and close supplier collaboration. This regional advantage enables firms to optimize component integration—such as sensors, displays, batteries, and wireless chips—into compact devices while ensuring performance reliability. Recent studies have identified component miniaturization, energy efficiency, and sensor innovation as key dimensions of technical competitiveness in smartwatches (Liu et al., 2024; Zhang et al., 2023).

A particularly relevant construct in emerging-market contexts is the secondary innovation strategy (Yang & Liu, 2020), which involves reconfiguring imported technologies to align with local capabilities and consumer demands. Rather than leading in frontier technologies, firms in Shenzhen often adopt, adapt, and improve upon existing innovations—a process enabled by strong technical management systems. This strategy fosters cost efficiency, time-to-market advantages, and the ability to scale quickly in response to demand fluctuations (Widya & Alfarisi, 2020).

In addition, internal process innovation—the refinement of operational systems and production workflows—is essential for achieving consistent quality, reducing defects, and enhancing speed to market. Phung et al. (2021) demonstrated that firms engaging in process innovation report significantly improved performance in product consistency and cost control, especially when managing high-volume production of complex devices. For firms in Shenzhen, such innovations often include automation in assembly lines, AI-powered quality inspection systems, and digital twins for process simulation (Wong et al., 2020).

Furthermore, external technology acquisition has become increasingly relevant as firms attempt to shorten development cycles and integrate cutting-edge capabilities. Firms often license technology, collaborate with research labs, or acquire startups to fill technological gaps (Deng & Lu, 2021). Effective technical management, therefore, involves balancing internal capabilities with external sourcing to achieve technological synergy.

Product Management and Market Responsiveness

Product management complements technical efforts by ensuring that the final product resonates with market needs. It includes the strategic planning,

development, and marketing of products across their lifecycle. In the smartwatch domain, where functionality, aesthetics, and usability are intertwined, product managers must synthesize technical possibilities with consumer insights (Chen & Yang, 2024).

Effective product managers are increasingly expected to lead cross-functional teams, align stakeholder interests, and serve as the "voice of the customer" in design decisions (Cooper, 2019). In Shenzhen's fast-paced market, successful product management demands agility, real-time market sensing, and rapid iteration cycles. Firms are adopting agile frameworks that allow them to release updates frequently, collect customer feedback, and adjust features accordingly (Chen & Liu, 2024).

Additionally, user-centered design has gained prominence in smartwatch development. Features such as biometric sensors, customizable interfaces, voice control, and third-party app integration must be tailored to diverse user segments, including fitness enthusiasts, professionals, and older adults (Kim & Shin, 2015). Zhang et al. (2023) found that smartwatches with adaptive functionality and lifestyle integration achieved higher retention rates among users, indicating the importance of contextual design thinking.

Another key aspect of product management is brand and experience design, which involves not just the product's physical attributes but the emotional and symbolic value it creates. Andreini et al. (2018) argued that wearable technologies increasingly function as expressions of identity, particularly among younger consumers. Consequently, branding strategies must be integrated into product management to enhance differentiation and loyalty.

Moreover, Shenzhen-based firms often operate in an environment where price sensitivity coexists with high user expectations. As such, product management must balance feature richness with affordability, which requires careful coordination with technical teams on trade-offs and component sourcing. The tension between innovation and affordability is a central challenge in managing smartwatch product portfolios in this region (Li et al., 2023).

Management Innovation as a Mediating Mechanism

Although technical and product management are both critical for smartwatch development, their integration often requires higher-level coordination. This is where management innovation becomes indispensable. Defined by Tidd and Bessant (2018) as the implementation of new organizational methods in business practices, workplace organization, or external relations, management innovation enables firms to break rigidities and reconfigure how value is created.

In Shenzhen's dynamic manufacturing landscape, management innovation manifests in forms such as agile management, matrix organizational structures, cross-functional task forces, and open innovation networks. These innovations facilitate better communication between engineers and marketers, allow faster decision-making, and promote a culture of experimentation (Anderson et al., 2024; Zhou et al., 2024).

One area where management innovation proves especially valuable is in supporting ambidextrous capabilities — the simultaneous pursuit of exploration (e.g., breakthrough innovations) and exploitation (e.g., refinement of existing products). O'Reilly and Tushman (2013) emphasized that ambidextrous organizations outperform those that are structurally rigid, especially in high-tech industries. For smartwatch firms, this translates into managing long-term R\&D while continuously updating current product lines.

Management innovation also supports knowledge integration, helping firms leverage external partnerships, consumer feedback, and supplier input in real-time. Scuotto et al. (2020) illustrated how open innovation frameworks are increasingly used by technology firms to crowdsource ideas and reduce innovation risk. In the Shenzhen smartwatch industry, where firms often face resource constraints and demand uncertainty, such collaborative mechanisms enhance both learning and adaptability.

Finally, innovation-oriented leadership is a recurring theme in recent literature. Leaders who encourage risk-taking, support team autonomy, and reward creativity foster organizational cultures that are better equipped to manage complexity and rapid change (Denti & Hemlin, 2012). In such contexts, management innovation is not just about structure but about mindset — a way of thinking that encourages continuous reinvention.

Identified Gaps and Theoretical Contributions

Despite the growing body of research on these domains, several gaps remain. First, most studies on smartwatch innovation rely on quantitative methods such as surveys, performance metrics, or secondary data. While valuable, these approaches often fail to capture the nuanced experiences and decision-making logics of those who enact innovation within firms (Levitt, 2019). Second, few studies explicitly examine the mediating role of management innovation in linking technical and product management. The assumption that innovation automatically translates into adoption ignores the organizational processes that facilitate such translation.

This study addresses these gaps by using qualitative methods to explore how senior managers, engineers, and product strategists in Shenzhen conceptualize and enact technical management, product development, and innovation practices. It provides rich, contextual insights into the mechanisms by which management innovation integrates technical capabilities and market demands, ultimately influencing smartwatch adoption.

By situating this inquiry within Shenzhen ' s unique industrial ecosystem — characterized by speed, density, and interfirm collaboration — this study also contributes to the broader theory of innovation management in emerging economies. It highlights how regional conditions shape innovation processes and how management innovation can serve as a critical lever for aligning internal operations with external opportunities.

Method

Research Paradigm and Design

This study is grounded in an interpretivist research paradigm, which recognizes that reality is socially constructed and best understood through the meanings individuals assign to their experiences (Schwandt, 2014; Merriam & Tisdell, 2016). Unlike positivist paradigms that seek generalizable truths through objectivity and measurement, interpretivism emphasizes the importance of context, the co-construction of meaning between researcher and participant, and the role of language, culture, and interaction in shaping understanding (Creswell & Poth, 2018).

This paradigm is particularly well-suited to the present research, which seeks to explore how strategic actors in Shenzhen ' s smartwatch industry perceive and navigate the relationship between technical management, product management, and management innovation. Given the complexity of organizational life and the situated nature of innovation, a qualitative design was essential to uncover nuanced insights that quantitative approaches would likely overlook (Levitt, 2019; Denzin & Lincoln, 2018).

Accordingly, this study employs a qualitative, exploratory, multiple-case design informed by interpretivism. This design allows for in-depth exploration of how innovation is enacted and understood within firms of varying sizes and structures. Each participant in the study can be considered part of an embedded case, contributing context-specific insights from technical, product, or executive management perspectives (Stake, 2006). The qualitative case-based approach is particularly useful for studying contemporary phenomena in real-world settings where the boundaries between phenomenon and context are blurred (Yin, 2018).

The study ' s design was inductive and iterative, meaning that data collection and analysis occurred in cycles, allowing emerging insights to inform subsequent data collection and analytic focus (Charmaz, 2014). The goal was not to test pre-formulated hypotheses but to generate theoretical insights from patterns and themes observed in the data. While existing literature on management innovation and high-tech product development informed the interview protocol, the analytic process remained open to unanticipated findings grounded in participants'experiences.

Participants

Participants in this study were selected using purposive sampling, a method particularly well-suited to qualitative inquiry that seeks depth over breadth (Patton, 2015). The aim was to recruit information-rich cases that could provide nuanced perspectives on the research focus — namely, the interplay between technical management, product management, and management innovation within the smartwatch industry in Shenzhen.

A total of 26 participants were interviewed, representing a cross-section of key roles within the industry. These included four technical managers, four

product managers, three innovation directors, three senior executives (including founders and general managers), and two R&D leads. All participants were currently employed at smartwatch manufacturing firms based in Shenzhen, with firm sizes ranging from small enterprises to large companies with international operations. The selection of multiple professional roles allowed for a multidimensional understanding of internal processes and strategic orientations.

The inclusion criteria were as follows: (1) participants had to be currently employed in a managerial or strategic position in a firm directly involved in smartwatch design, development, or production; (2) they had to have at least three years of experience in the industry; and (3) they needed to be directly engaged with or knowledgeable about innovation processes within their organizations. These criteria ensured that participants possessed both experiential depth and organizational insight relevant to the study’s objectives.

Participants were identified through professional networks, industry forums, and local innovation clusters in Shenzhen such as Huaqiangbei and Nanshan Science Park. Initial contacts were followed by snowball sampling, where participants recommended additional informants who met the criteria and could contribute diverse perspectives. This network-based recruitment strategy proved effective in accessing participants with varied organizational and functional backgrounds.

The final sample was diverse in terms of educational and professional backgrounds, with participants holding degrees in engineering, business, and information technology. Several had prior experience in multinational corporations before transitioning to the local innovation ecosystem in Shenzhen. Most had also been involved in both successful and unsuccessful product launches, allowing them to offer reflective insights into the challenges and enablers of smartwatch adoption.

Participants were informed of the study's objectives and assured of confidentiality and anonymity. Each interview was preceded by a signed informed consent form. To preserve anonymity, pseudonyms were assigned to all participants, and identifying company information was omitted from transcripts. The demographic spread of participants—alongside the variety of firm sizes and organizational roles—enhanced the credibility and richness of the dataset.

The purposive sample design was guided by the principle of theoretical saturation, whereby data collection continued until no new major themes emerged from the interviews (Glaser & Strauss, 1967). This ensured a robust foundation for the subsequent thematic analysis and strengthened the study’s contribution to understanding strategic management processes in high-tech consumer markets.

Data Collection

The primary form of data collected in this study was semi-structured, in-depth interviews. These interviews were conducted with 16 purposively sampled participants, including technical managers, product managers, innovation directors, R&D leads, and senior executives from smartwatch manufacturing firms in Shenzhen. The data collection protocol evolved iteratively based on initial

findings and thematic saturation. The interview guide was developed in alignment with the study ' s conceptual focus on technical management, product management, and management innovation, and was refined after the first few interviews to incorporate emergent themes and improve question clarity.

Each interview was conducted in a private setting, either virtually or in a designated office space, ensuring participant comfort and confidentiality. Interviews were conducted one-on-one, with no third parties present, and lasted between 75 and 110 minutes, with a mean duration of approximately 90 minutes. Interviews were audio-recorded with permission and transcribed verbatim. The depth of engagement was substantial, with each session involving extended dialogue and probing questions designed to elicit detailed reflections on organizational practices, decision-making logics, and perceptions of innovation processes.

Reflexivity was actively managed throughout data collection. The researchers maintained reflexive memos to document evolving impressions, potential biases, and analytical hunches. These memos were revisited after each interview to inform subsequent questioning and guide thematic exploration.

The interview questions covered a range of topics relevant to the study' s framework, including open-ended prompts such as: " Can you describe how new technologies are integrated into product planning? ", " What challenges do you face in aligning technical and market priorities? ", and " How has your organization changed its management approach to support innovation? " Most questions were open-ended, allowing for narrative responses, with follow-up prompts used to clarify or deepen responses.

This systematic and adaptive approach ensured rich, contextualized data capable of supporting the study' s interpretive and inductive analytical goals.

Data Analysis

The data analysis for this study followed the principles of thematic analysis, a widely used method in qualitative research for identifying, analyzing, and reporting patterns (themes) within data (Braun & Clarke, 2006). Thematic analysis was chosen for its flexibility and its ability to generate a rich, detailed, yet complex account of data. It enabled the research team to uncover latent meanings, organizational practices, and managerial logics that shape the adoption of smartwatches, particularly through the interplay of technical management, product management, and management innovation.

Data were analyzed inductively, meaning that themes were derived from the data rather than being imposed a priori. Thematic analysis was conducted following Braun and Clarke' s (2006) six-phase framework. First, all interviews were transcribed verbatim and reviewed thoroughly, with audio recordings replayed to capture nonverbal cues and ensure accuracy. Initial codes were then manually generated line-by-line, using Microsoft Word and coding matrices to assign meaning to significant phrases while staying close to participants ' language. These codes were organized into broader categories and preliminary

themes aligned with the research questions, with attention to interactions among technical management, product management, and management innovation. Themes were reviewed and refined through regrouping, merging, and checking for outliers. They were then clearly defined and renamed to reflect their conceptual essence—for example, "speed vs. quality" became "strategic tension between innovation velocity and stability." Finally, the themes were woven into a coherent narrative supported by representative quotes from participants.

The analysis was iterative and recursive, rather than linear. As new insights emerged, earlier codes and themes were revisited and refined. Thematic saturation was achieved when no new codes emerged, and patterns were sufficiently established to support robust conceptual development.

To enhance credibility, the analysis included several trustworthiness strategies. Peer debriefing was conducted with two qualitative research experts to review codes and themes for potential bias or oversight. Member checking was performed with five participants to validate interpretations and ensure that the themes resonated with their lived experience. Reflexive memo-writing supported the researcher's critical awareness of assumptions and positionality during interpretation (Birks et al., 2008).

The coding process revealed not only thematic convergence but also inter-theme dynamics—such as how management innovation practices functioned as a bridge between technologically oriented decisions and market-driven product refinements. These emergent interconnections significantly informed the study's discussion and theoretical contributions.

Results

Thematic analysis revealed three overarching themes that explain how smartwatch firms in Shenzhen strategically integrate technical and product management through the mediating role of management innovation. These are: (1) Strategic Alignment between Technology and Market Demands, (2) Innovation as Organizational Capability, and (3) Management Innovation as a Dynamic Integrator. Below, each theme is discussed with supporting quotes from participants across roles and firms.

Theme 1: Strategic Alignment between Technology and Market Demands

Participants emphasized the importance of aligning advanced technical capabilities with rapidly shifting consumer preferences. While technical teams pushed for innovation in hardware and system performance, product teams stressed the importance of usability, timing, and market readiness.

"The technology is ready much earlier than the customer is. So our job is to find the right moment and the right packaging to deliver it." (Participant 06, Product Manager)

"Sometimes the engineering team gets excited about what's possible, but the customer just wants something simple and stable." (Participant 13, Product Manager)

“Our most successful products were not the most advanced ones—but the ones that made life easier for the customer.” (Participant 04, Marketing Executive)

Several firms addressed this tension through structured routines for cross-functional collaboration. Weekly synchronization meetings, shared performance dashboards, and agile iteration cycles helped teams integrate user feedback into technical planning.

“We’ve learned that a rushed innovation often ends up hurting brand reputation. That’s why product and R\&D teams meet weekly now to ensure alignment.” (Participant 03, Technical Director)

“Our mistake in the past was thinking engineering leads the way. Now, product managers co-sign every major design decision.” (Participant 07, Innovation Lead)

“We test features with user groups before committing to final specs. That wasn’t common practice five years ago.” (Participant 14, UX Researcher)

This theme illustrates that strategic alignment between departments is a dynamic, ongoing process, requiring shared accountability and clear communication.

Theme 2: Innovation as Organizational Capability

Participants described innovation not as a discrete activity, but as an embedded organizational mindset. The most adaptive firms promoted experimentation, rewarded initiative, and developed systems for learning from both success and failure.

“We don’t see innovation as a department. It’s how we work—from marketing to supply chain. Everyone has to think about what’s next.” (Participant 11, Innovation Director)

“Our engineers and designers are encouraged to fail fast and learn. That’s how we’ve stayed ahead of copycats.” (Participant 02, Head of R\&D)

“If someone proposes an idea, we don’t ask for a full business plan first. We ask how fast it can be prototyped and tested.” (Participant 01, CEO)

Firms described various internal mechanisms to support this capability, including open suggestion systems, internal competitions, small cross-functional “beta” teams, and collaborative tools that allowed faster experimentation.

“We built a mini-innovation lab inside the company—anyone can suggest ideas. Some of our biggest product upgrades started there.” (Participant 01, CEO)

“One of our interns created a smartwatch face prototype that ended up in production. That would’ve never happened without an open system.” (Participant 09, Design Manager)

Innovation was also linked to resilience. Participants reported that firms with innovation embedded in culture were more agile during supply chain disruptions, regulatory changes, and customer backlash.

“COVID hit us hard, but because we’re used to moving fast and adapting, we redesigned supply routes and released a new model remotely.” (Participant 12, Operations Director)

This theme shows that sustainable innovation arises from culture, structures, and routines that collectively foster risk-taking, speed, and responsiveness.

Theme 3: Management Innovation as a Dynamic Integrator

The most central theme was the mediating role of management innovation in aligning technology and product development. Participants described shifts in leadership mindset, team configurations, performance systems, and workflows that enabled better integration and adaptability.

“We moved from a top-down structure to a team-based matrix, especially for new product projects. It was hard at first, but now decisions are faster and better.” (Participant 08, Senior Executive)

“We changed our incentive system—engineers are now partly evaluated on customer satisfaction scores.” (Participant 10, Product Strategy Lead)

“Our management innovation was simple: break the walls. We used to be siloed. Now we run cross-functional sprints every two weeks.” (Participant 05, Engineering Lead)

Other firms implemented agile product development practices, adopted OKRs, and launched “innovation bridges”—teams specifically designed to translate technical innovation into commercial product solutions.

“We created an 'innovation bridge' team to translate R\&D ideas into product roadmaps. They speak both languages—technical and business.” (Participant 15, VP of Strategy)

“Our leadership started to walk the talk—when the CEO sits in sprint reviews, people know this is serious.” (Participant 06, Product Manager)

Management innovation also enabled stronger partnerships with external actors—suppliers, research institutions, and even customers—through open innovation practices.

“We invite customers to early-stage design workshops. That was a radical shift for our engineers, but it changed how we build.” (Participant 13, Lead Designer)

“We co-develop firmware with one of our component suppliers now. That never happened before. It speeds up everything.” (Participant 04, Tech Partner Manager)

Overall, this theme illustrates how dynamic managerial practices function as the connective tissue between innovation and execution — transforming fragmented departments into coherent innovation systems.

These findings reveal that smartwatch adoption in Shenzhen is not merely a function of advanced technology or market fit, but is contingent on how firms orchestrate technical and product domains through adaptive management innovation. The following Discussion section further explores the theoretical and practical implications of these dynamics.

Discussion

This study set out to explore how technical and product management contribute to smartwatch adoption in Shenzhen and how management innovation mediates this relationship. Drawing on interviews with senior managers, product developers, and innovation strategists, the findings contribute new insights into the dynamic processes underlying strategic integration and product success in high-tech consumer industries. These results hold several theoretical, methodological, and practical implications for innovation management, particularly within emerging economy contexts.

The findings substantively extend existing literature by showing that successful smartwatch adoption in Shenzhen depends not merely on the presence of technical capability or market insight, but on firms' ability to dynamically synchronize these domains through management innovation. While past studies have separately acknowledged the roles of technical management (e.g., Yang, 2020; Wang et al., 2023) and product management (e.g., Cooper, 2019; Chen & Yang, 2024), few have examined how these functions interact at a strategic level or how they are mediated by managerial reconfiguration. This study thus elaborates on innovation theories by illustrating that management innovation is not simply a supporting process, but a central mechanism that enables firms to convert technical potential into market impact (Tidd & Bessant, 2018).

Furthermore, the results support and enrich the concept of ambidexterity in organizational theory (O’Reilly & Tushman, 2013). The evidence that firms in Shenzhen can balance exploration (R\&D and new technologies) and exploitation (commercial delivery and refinement) through agile managerial practices adds empirical weight to the theory, especially within non-Western, fast-growth innovation environments.

The study also challenges the traditional dichotomy between “technical” and “business” functions by showing how role boundaries are becoming increasingly porous in firms that adopt team-based and cross-functional structures. This observation aligns with contemporary literature on innovation ecosystems and collaborative innovation (Scuotto et al., 2020) but offers new nuance by

emphasizing the importance of internal culture and leadership adaptation in fostering such integration.

While the findings echo earlier research that emphasizes agility, user-centered design, and modular innovation (Kim & Shin, 2015; Zhang et al., 2023), they differ in highlighting how these outputs are enabled by deeper shifts in management logic and structure. For instance, past studies have often focused on product-level or technological advancements, but this research foregrounds the organizational capacity to innovate as the true differentiator. It adds to a growing stream of scholarship recognizing innovation as a systemic capability rather than a departmental function (Andreini et al., 2018).

Furthermore, unlike studies conducted in North American or European contexts where resource abundance may enable formal innovation labs or long-term incubation, the Shenzhen case reveals a leaner, faster-paced, and more improvisational approach to innovation — one that is heavily reliant on lateral communication, informal experimentation, and "on-the-ground" decision-making.

Although the study emphasizes the enabling role of management innovation, alternative explanations may exist. It is possible, for example, that the observed coordination and adaptability stem from broader institutional or regional factors—such as Shenzhen's dense innovation networks, government incentives, or the highly competitive local environment—rather than from deliberate internal innovations alone. Additionally, firms with flatter hierarchies or younger leadership teams may naturally exhibit more agile behaviors, independent of formal management redesigns.

Future research could explore these alternative drivers by comparing Shenzhen firms with counterparts in other Chinese cities or international contexts. Longitudinal studies might also reveal whether these innovations are sustained over time or are more contingent and temporary.

One of the strengths of this study lies in its use of in-depth qualitative interviews across diverse roles and firm sizes, which enabled a rich and multidimensional understanding of the innovation process. The iterative thematic analysis, combined with peer debriefing and member checking, enhanced the trustworthiness of the findings.

However, the study also has limitations. First, the sample was limited to 16 participants within Shenzhen. While diverse in role and experience, the findings cannot claim statistical generalizability. Second, because the data rely on self-reported perceptions, there is a risk of retrospective bias or socially desirable responses. Third, the study primarily reflects the voices of middle to senior management and may underrepresent the experiences of frontline developers or users.

Readers should exercise caution in transferring these findings to settings outside of Shenzhen or the consumer electronics industry. The region's innovation ecosystem is unique in terms of speed, supply chain integration, and institutional support. While some management innovations identified — such as

agile teams or cross-functional KPI alignment — may be applicable elsewhere, their effectiveness may depend on cultural, regulatory, and market conditions.

Nevertheless, the study offers analytical generalizability by identifying mechanisms — such as iterative coordination, lateral integration, and reflexive leadership — that may be relevant to other firms seeking to improve innovation outcomes in similarly fast-paced environments.

This research encountered minimal ethical dilemmas but required sensitivity in handling competitive and proprietary information. Given the high-stakes environment of smartwatch innovation, participants were sometimes reluctant to disclose precise technical strategies. To address this, the research team ensured anonymity, secured consent, and excluded any identifiable information from quotations. Future researchers should anticipate similar concerns when working in commercially sensitive industries and consider co-developing confidentiality agreements with firms in advance.

Implications for Future Research

Future research can build on the present findings by examining how management innovation unfolds over time within technology firms. Longitudinal research designs, such as those recommended by Yin (2018) and Stake (2006), would be particularly effective in revealing how new managerial structures and innovation routines stabilize, evolve, or dissolve in response to internal pressures or external market shifts.

There is also a strong rationale for comparative studies. While this study focuses on Shenzhen, comparative work across regions — such as Hangzhou, Singapore, or Munich — could assess the generalizability of the identified innovation mechanisms and highlight context-contingent variations (Tidd & Bessant, 2018; Liu et al., 2024). Similarly, future studies could explore whether management innovations differ in their form or effectiveness across sectors such as healthcare technology, automotive electronics, or financial tech ecosystems.

Further, this study focused on strategic-level actors. Expanding the scope to include operational-level employees and external stakeholders such as suppliers or customers could offer a fuller picture of how innovation practices are experienced and negotiated across boundaries (Denzin & Lincoln, 2018). Researchers could also use ethnographic or participatory approaches to capture tacit knowledge that traditional interviews may miss (Schwandt, 2014; Finlay, 2002).

Lastly, future research could adopt mixed-methods approaches that combine qualitative insights with performance metrics to examine whether the adoption of specific management innovations correlates with improved time-to-market, product quality, or customer retention (Creswell & Poth, 2018).

Implications for Policy

From a policy perspective, the findings underscore the need for innovation policy to evolve beyond a narrow focus on R\&D or technological patents. Governments often direct resources toward hard technologies while

neglecting organizational or managerial capacity-building. As this study illustrates, managerial innovation plays a critical mediating role in the successful commercialization of new products.

Policymakers should consider creating funding mechanisms and incentive structures that encourage firms—especially SMEs—to experiment with new organizational models, such as agile product teams, cross-functional collaboration, and open innovation platforms (Zhou et al., 2024; Tidd & Bessant, 2018). These interventions are especially critical in developing regions where path-dependent hierarchical structures may impede responsiveness.

In addition, capacity-building initiatives — including leadership development programs, innovation fellowships, and policy labs — can help managers and policy actors alike to acquire skills for adaptive governance, participatory innovation, and multi-sector coordination (Lincoln & Guba, 1985). Promoting local knowledge exchange between startups, established firms, and research universities could also catalyze regionally embedded models of innovation management.

Implications for Practice

At the level of practice, the study reinforces that organizational success in technology markets is no longer defined solely by product features or cost efficiency, but by a firm's ability to continuously align its internal capabilities with external opportunities (Tidd & Bessant, 2018; Levitt, 2019). This requires deliberate investment in management systems that are capable of integrating diverse expertise and enabling adaptive learning.

Firms seeking to emulate the agility observed in Shenzhen's smartwatch sector should implement management structures that support iterative coordination and strategic flexibility — including regular cross-departmental sprints, decentralized decision-making, and innovation performance metrics that cut across silos (Anderson et al., 2024). Leadership must be prepared to shift from command-and-control models to facilitative models that promote psychological safety, transparency, and bottom-up creativity (Denti & Hemlin, 2012).

Organizations can also benefit from fostering innovation ecosystems internally and externally, such as incubators, open labs, or joint ventures with suppliers and users. These platforms serve as both strategic buffers and feedback loops, allowing firms to test and refine innovations before broader rollout (Scuotto et al., 2020).

Finally, innovation should be embedded in organizational culture, supported by incentive systems that reward experimentation, tolerate failure, and emphasize continuous learning (Cooper, 2019; Birks et al., 2008). In this way, innovation becomes a living system rather than a project milestone.

In sum, this study provides not only a richer theoretical understanding of how management innovation mediates technical and product strategies but also offers actionable insights for policy design and practical organizational transformation. Sustainable innovation is not just about inventing better products—it is about building better ways of working.

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