Human-Centered Management and Marketing Strategies in Educational Technology: An Empirical Analysis of XD Technology's Attention Training Innovation and Implementation

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Through a comprehensive case analysis, this paper examines XD Technology's human-centered management and marketing strategies in attention training. The research demonstrates how the company has constructed a distinctive educational technology ecosystem through four core approaches: "products returning to human-centered principles", "marketing returning to human-centered principles", "services returning to human-centered principles", and "strategy focusing on human-centered principles" through organizational transformation. Based on practical implementation in the Minxi revolutionary base area, XD Technology has successfully achieved technology democratization and urban-rural educational integration, providing a replicable "Longyan Model" for educational equity. The findings indicate that user-needs-oriented human-centered strategies enhance enterprise competitiveness and contribute significantly to educational modernization and rural revitalization. The research employs case study methodology to investigate XD Technology's 16-month implementation across 23 schools, benefiting over 3,000 students, thereby providing theoretical guidance and practical insights for sustainable development in educational technology enterprises.

Keywords: XD technology, Attention training, Human-centered management, Educational technology, Urban-rural educational integration,Brain-computer interface technology

1. Introduction

Global education faces unprecedented opportunities for digital transformation, with the educational technology industry experiencing continuous growth. The international education technology market is projected to reach $350 billion by 2025. Within this context, attention training has emerged as a critical component of cognitive enhancement, garnering increasing attention from both educational and technology sectors. As the world's largest education market, China faces significant urban-rural educational development

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imbalances. The challenge of leveraging advanced technology to narrow educational gaps and promote educational equity has become an urgent issue requiring resolution.

XD Technology represents an innovative enterprise in the attention training field, integrating brain science, artificial intelligence, and educational theory. The company has achieved remarkable results through practical implementation in Longyan City, Fujian Province. This development trajectory reflects how educational technology enterprises can balance technological innovation and academic needs, achieving unity between commercial success and social value through human-centered management strategies.

Posner and Petersen's three-network attention theory provides a solid scientific foundation for attention training[1]. This theory divides the human brain's attention system into three interacting subsystems: the alerting attention network, the orienting attention network, and the executive attention network. This theoretical framework provides important insights into understanding attention mechanisms and guides the scientific design of attention training programs.

Best et al. conducted longitudinal research on a large representative sample of children aged 5 to 17, discovering significant positive correlations between executive function and academic achievement[2]. Results demonstrated that all components of executive function, including working memory, cognitive flexibility, and inhibitory control, closely correlate with performance in mathematics, reading, and science subjects.

Lodge and Huf emphasized in their comprehensive review of attention's role in digital-age learning that technology proliferation brings new opportunities and challenges to learning[3]. In this context, cultivating students' attention abilities to maintain effective learning states in information-rich environments has become a crucial challenge for educators.

In their innovative learning environment research, Peng et al. highlighted that personalized adaptive learning is emerging as a novel pedagogical approach[4]. Research demonstrates that attention, as a trainable cognitive skill, can be significantly improved through systematic scientific intervention, providing new technological pathways and theoretical support for educational equity and quality enhancement.

Human-centered management theory emphasizes placing “people” as the core driving force of enterprise development, focusing on user needs insight, employee value creation, and social responsibility commitment. In educational technology, this philosophy manifests as learner-centered product design, experience-oriented service optimization, and value co-creation-targeted ecosystem construction.

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Sweller's cognitive load theory provides crucial theoretical guidance for attention training instructional design[5]. This theory emphasizes learners' limited cognitive resources, proposing three concepts: intrinsic, extraneous, and germane cognitive load. Based on this theory, attention training systems must reasonably design learning task difficulty gradients, optimize interface interaction and information presentation methods, and provide appropriate cognitive challenges for learners.

2. XD Technology's Human-Centered Product and Marketing Strategy System

2.1 Products Returning to "Human-Centered Principles": Needs-Driven Adaptive Product Innovation System

XD Technology's product development consistently follows "user-centered design" core principles, establishing comprehensive multi-dimensional user needs research systems that deeply understand genuine needs and pain points of students, teachers, parents, and other stakeholders in the educational ecosystem. This profound insight focuses not only on explicit functional requirements but also emphasizes uncovering implicit emotional needs and value expectations, providing scientific decision-making foundations for product innovation.

The company established a user research framework covering cognitive assessment, behavioral observation, and emotional Experience. At the cognitive assessment level, the system precisely identifies students' cognitive characteristics and learning preferences through standardized cognitive ability tests, learning style scales, and attention assessment tools. For behavioral observation, the company conducts an in-depth understanding of students' actual learning behaviors and habits through classroom observation, learning process recording, and home learning environment research. At the emotional Experience level, the system captures the emotional needs and value expectations of students, teachers, and parents through interview research, focus group discussions, and monitoring of emotional state.

Alwadei et al. confirmed through research that adaptive e-learning interventions significantly outperform traditional teaching methods in student learning outcomes[6]. Through randomized controlled trials, this study compared adaptive learning systems with conventional lecture-based teaching in dental student learning. Results showed that students using adaptive learning systems performed better in knowledge mastery, skill application, and learning satisfaction.

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Based on deep needs insight, XD Technology developed revolutionary attention training headband technology. This technology represents a significant breakthrough in educational neuroscience, with its core involving the deep integration of artificial intelligence algorithms with brain-computer interface technology. The attention headband employs independently developed high-precision brainwave signal acquisition chips capable of real-time monitoring of brain attention states with 96% accuracy, comparable to medical-grade equipment.

2.2 Scientific Design of Personalized Training Programs

XD Technology's personalized training programs are based on the latest cognitive neuroscience research findings. They combine big data analysis and artificial intelligence technology to customize attention enhancement plans for each student. The system first establishes students' attention baseline levels through fundamental assessment, then generates personalized training plans based on students' cognitive characteristics, learning objectives, and time arrangements.

Training programs employ progressive difficulty design, following basic principles of cognitive load theory. Initial stages focus on cultivating fundamental attention abilities through simple visual tracking and auditory discrimination tasks, helping students establish basic attention concentration capabilities. Intermediate stages introduce multitasking processing and attention switching training to improve students' cognitive flexibility and executive control abilities. Advanced stages combine attention training with actual learning tasks, effectively transferring training effects.

Christodoulou and Angeli demonstrated that adaptive learning technology can effectively enhance teachers' technological pedagogical content knowledge, providing technical support for personalized education[7]. Results show significant improvements in teaching design capabilities, technology application abilities, and student assessment competencies among teachers participating in adaptive learning technology training. Gligorea et al. conducted a comprehensive literature review revealing artificial intelligence applications in e-learning[8]. This review analyzed recent AI technology applications in adaptive learning, personalized recommendations, and intelligent assessment, summarizing development trends and challenges.

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2.3 Marketing Returning to "Human-Centered Principles": Value Co-Creation Precise Communication Strategy

XD Technology's marketing strategy abandons traditional educational technology enterprises' approach of emphasizing technology over the humanities, transitioning toward precise communication and emotional connection models centered on user value creation. The company recognizes that in an information-overloaded era, simple product function promotion can no longer effectively reach target users. Sustainable user relationships must be established through deep value recognition and emotional resonance.

Through big data analysis and user behavior research, the company constructed a precise user persona system based on multidimensional characteristics. This system includes not only traditional demographic characteristics such as age, gender, and geographical distribution but, more importantly, analyzes users' educational philosophies, value concepts, behavioral patterns, and needs characteristics.

Dwivedi et al. emphasized in digital and social media marketing research that future marketing research requires greater focus on user Experience and value co-creation[9]. The research proposed user-centered marketing paradigms by deeply analyzing digital marketing development trends. Research indicates that successful digital marketing is no longer unidirectional information transmission but rather a bidirectional interaction and value co-creation process between brands and users.

Based on precise user personas, XD Technology developed scenario-based content marketing systems. The company conducted an in-depth analysis of different user groups' usage scenarios, needs contexts, and decision-making processes, designing targeted content and communication strategies for each scenario. The company produced extensive popular science content in family education scenarios, including parent-child attention training, family learning environment optimization, and child cognitive development.

The company established "user-recommender-new user" social communication chains, fully utilizing social network amplification effects. The company formed positive word-of-mouth communication mechanisms by encouraging satisfied users to share usage experiences and training results, inviting education experts and brain science researchers to provide professional endorsements for product effectiveness, and building user communities for attention training Experience exchange.

Fig. 1 adopts the core theoretical framework of my research, showing how the four pillars (Products, Marketing, Services and Strategy) work together in a human-centered approach. It helps quickly understand the integrated nature of

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XD Technology's management philosophy. XD Technology's human-centered approach integrates four core dimensions that work synergistically to create value for all stakeholders. This framework demonstrates how educational technology companies can balance technological innovation with human needs, ensuring sustainable growth and meaningful educational impact.

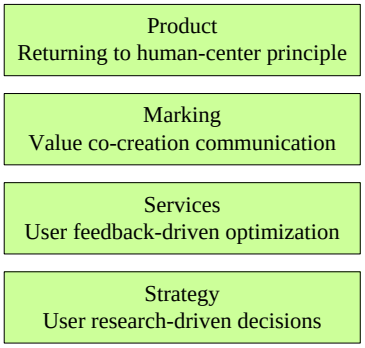

Fig. 1 XD technology's four-pillar human-centered management framework

3. Service Experience Optimization and Practical Implementation Analysis

3.1 Services Returning to "Human-Centered Principles": User Feedback-Driven Experience Optimization Mechanism

XD Technology established a service optimization system with user feedback as the core driving force, focusing on product function improvement and comprehensive user Experience enhancement. The company recognizes that in the educational technology field, while technological advancement is essential, user Experience quality often determines product success. Therefore, the company established comprehensive user feedback collection, analysis, and application mechanisms from the initial product design stages.

The company constructed multi-level, comprehensive user feedback collection mechanisms. At the product level, systems include intelligent feedback collection functions capable of real-time capturing user operational behaviors, usage preferences, and satisfaction evaluations. The company established regular user research systems at the service level, deeply understanding user needs, changes, and Experience feelings through online questionnaires, telephone interviews, and focus groups. At the social level, the company established social media monitoring teams to monitor user discussions and evaluations across major platforms in real time, promptly discovering and responding to user concerns.

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3.2 Data-Driven Service Optimization Practices

Based on massive user feedback data collected, XD Technology established scientific data analysis and application systems. The company employs advanced data mining technology and machine learning algorithms to extract valuable insights and improvement suggestions from user feedback. In interface design optimization, the company continuously optimizes product interaction interfaces and operational processes through user behavior heatmap analysis, eye-tracking research, and usability testing. In function iteration upgrades, the company established product development roadmaps based on user needs priorities, ensuring each function update genuinely resolves user pain points.

The company's data-driven approach extends to comprehensive user Experience mapping, where every touchpoint in the user journey is analyzed and optimized. Through advanced analytics, XD Technology identifies patterns in user behavior that indicate potential friction points or opportunities for enhancement. The system employs predictive analytics to anticipate user needs before they become explicit, enabling proactive service improvements rather than reactive fixes.

Furthermore, the company has implemented A/B testing frameworks for all major product features and service components. This systematic approach to experimentation allows the team to validate hypotheses about user preferences and optimize features based on empirical evidence rather than assumptions. The data analysis extends beyond simple usage metrics, including emotional engagement indicators, learning progression patterns, and long-term retention factors.

Rincón-Flores et al. demonstrated through research that adaptive learning strategies can significantly improve teaching processes10]. This study verified adaptive learning effectiveness through a multiple case study methodology in different educational contexts. Research found that adaptive learning systems can dynamically adjust learning content difficulty, pace, and presentation methods based on students' learning progress, ability levels, and interest preferences, thereby improving learning efficiency and effectiveness. Taylor et al. further emphasized that personalized and adaptive learning systems can provide customized learning experiences based on students' learning styles, ability levels, and target expectations[11].

Qi et al. indicated in massive open online course personalized learning activity research that self-optimizing feedback mechanisms can effectively promote learning management system improvements[12]. The research verified the effectiveness of feedback-driven system optimization methods through online learning platform user behavior data analysis.

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3.3 In-Depth Analysis of Minxi Region Practice Case

XD Technology's practice case in Longyan City, Fujian Province, provides a vital reference model for educational technology application in revolutionary base areas. Since the project's official launch in September 2023, through 16 months of intensive implementation, significant achievements have been made in promoting urban-rural educational integration and advancing educational equity. The project covers 23 primary schools in Longyan City's Xinluo District, benefiting over 3,000 students, representing 55% of the district's total primary school students, achieving unprecedented coverage in local educational history.

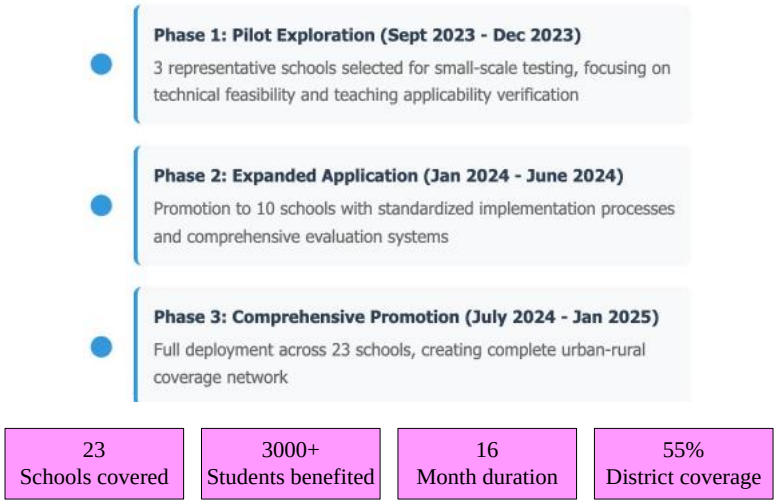

Fig. 2 Minxi region implementation timeline and key achievements

Fig. 2 illustrates the phased implementation approach with key statistics prominently displayed. It provides a clear visual representation of the project's progression from pilot to full deployment, making the scale and impact of the implementation immediately apparent.

Project implementation adopted phased, hierarchical advancement strategies. The first phase served as a pilot exploration period, selecting three representative schools for small-scale experimentation, focusing on verifying technical feasibility and teaching applicability. The second phase expanded the application, promoting the project to ten schools while establishing standardized implementation processes and evaluation systems. The third phase achieved comprehensive promotion, extending the project to 23 schools and forming complete application networks covering urban and rural areas.

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Younger et al. confirmed through research that sustained attention abilities significantly impact children's real-world academic skills[13]. This study verified the long-term impacts of attention training on academic achievement through large-scale longitudinal tracking of children's samples. Research found that children receiving systematic attention training demonstrated superior learning abilities in reading comprehension, mathematical calculation, and scientific reasoning across multiple subject areas.

Troussas et al. demonstrated through research that personalized teaching strategy adaptation using multi-criteria decision-making methods can significantly enhance adaptive learning system effectiveness[14]. The research constructed personalized teaching strategy selection models through TOPSIS methods, verifying the efficacy of customized service design based on multi-dimensional evaluation.

3.4 Innovative Practice of "1+7" Home-School Collaboration Model

XD Technology innovatively constructed a "school learning - home practice - home-school co-education" 1+7 model in the Longyan region, fully embodying the critical value of home-school cooperation in modern educational concepts. The company equipped each partner school with professional attention training equipment and systems in school learning components, establishing standardized classroom training processes. Through skilled training, teachers mastered system operation methods and teaching techniques, effectively integrating attention training content into daily instruction.

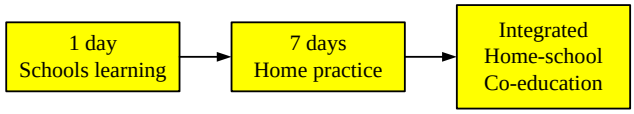

Fig. 3 "1+7" home-school collaboration model structure

Fig. 3 demonstrates the innovative collaboration model that extends learning from 1 day at school to 7 days of home practice. It shows the flow and integration between school learning, home practice, and collaborative co-education, making this unique educational approach easy to understand. And the model components; include

1. School Learning: Professional attention, training equipment, real-time brainwave monitoring, gamified training modes, personalized programs.
2. Home Practice: Which are "Focus Mini-Classroom", "Family Children", and "Parent-Child Games" visual progress tracking.

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3.Co-education Integration: Seamless data sharing, collaborative progress monitoring, unified learning objectives.

The innovative model extends learning beyond the classroom, creating a comprehensive attention training ecosystem involving educators and families in student development.

1.Enhanced school learning environment

System digital teaching functions provide strong technical support for classroom instruction. Through real-time brainwave monitoring, teachers can intuitively understand each student's attention state and promptly adjust teaching strategies and pace. Children can self-regulate to correct attention states through real-time numerical feedback, creating a responsive learning environment where students become active participants in attention management. The system also provides gamified training modes, effectively stimulating student learning interest and participation enthusiasm through virtual characters, challenge tasks, and point rewards. Personalized training programs ensure students obtain attention enhancement plans suitable for their ability levels and learning characteristics.

The classroom implementation includes sophisticated data visualization tools that allow teachers to monitor class-wide attention patterns in real-time, enabling immediate pedagogical adjustments. The system generates detailed attention analytics that help educators understand which teaching methods and content types most effectively maintain student focus, leading to evidence-based instructional improvements.

2.Comprehensive home practice integration

Home practice components reflect the critical role of family education in child development. The company provided parents with specialized guidance materials, including "Focus Mini-Classroom", "Family Children", and "Parent-Child Games", helping parents master scientific attention cultivation methods. These resources are designed to seamlessly integrate attention training into daily family routines, making the practice sustainable and enjoyable for children and parents.

Through visual data presentation and gamified interactive design, parents can participate in training processes with their children, improving training effectiveness and enhancing parent-child relationships. The system provides real-time progress tracking, allowing families to celebrate milestones together, creating positive reinforcement cycles that motivate continued engagement.

León et al. emphasized in serious game learning Experience design research that innovative learning Experience design can significantly enhance student

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engagement and learning effectiveness[15]. The research verified the effectiveness of gamified learning through a case analysis of serious game applications in education. Research found that good gamification design can stimulate intrinsic motivation and improve learning continuity and depth.

4. Strategic Focus on Human-Centered Principles and Organizational Development

4.1 Strategy Returning to "Human-Centered Principles": User Research-Driven Decision-Making Mechanism

XD Technology positions user research as the core foundation for strategic decision-making, establishing systematic user research systems. The company recognizes that in educational technology, user group diversity and complexity of needs require enterprises to develop scientific, comprehensive user insight mechanisms. The company combines quantitative and qualitative research methods, obtaining large-scale user behavior data and statistical patterns, and a deep understanding of individual users' underlying needs and value expectations.

The company established forward-looking user research mechanisms, focusing on current users' explicit needs and, more importantly, on excavating potential and future educational needs. Through cross-disciplinary cooperation with education experts, brain science researchers, and technology developers, the company can predict educational technology development trends and preemptively deploy related products and services.

Hong and Song discovered in online education Experience value research that Experience value enhancement significantly affects user satisfaction and loyalty[16]. This study analyzed antecedent and consequent variables of Experience value in online education through structural equation modeling, finding that service quality, system quality, and information quality are essential factors affecting Experience value.

4.2 Organizational Culture and Human-Centered Talent Development Transformation

XD Technology consistently maintains human-centered principles throughout organizational transformation processes, reflected in external user focus and internal employee attention and development. The company established an all-staff participation innovation culture, encouraging every employee to think from the user's perspective and propose improvement

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suggestions, achieving growth with employees, partners, and all stakeholders to realize individual potential.

1.Comprehensive talent development ecosystem

The company implements diversified talent development strategies, particularly emphasizing cross-disciplinary talent cultivation and recruitment. In team composition, the company brings together professional talents from education, psychology, brain science, artificial intelligence, user Experience design, and other fields, forming strong cross-disciplinary collaboration capabilities. This diversified talent structure provides solid intellectual support for company innovation and development.

XD Technology has established comprehensive career development pathways, recognizing and nurturing technical and soft skills. The company's talent development framework includes mentorship programs that pair senior researchers with emerging professionals, creating knowledge transfer mechanisms that preserve institutional wisdom while fostering innovation. Regular cross-functional team rotations ensure employees understand the educational technology ecosystem holistically.

2.Innovation-driven organizational culture

The company culture emphasizes psychological safety and creative risk-taking, encouraging employees to experiment with novel approaches to attention training challenges. Regular innovation sessions and hackathons provide structured cross-team collaboration and breakthrough thinking opportunities. The company has established innovation metrics that recognize successful implementations and valuable failures contributing to organizational learning.

Employee feedback systems are deeply integrated into organizational decision-making processes, ensuring that internal perspectives inform strategic directions. The company maintains transparent communication channels that allow ideas to flow freely across hierarchical levels, fostering a truly collaborative environment where the best ideas prevail regardless of their source.

Crittenden et al. demonstrated through research that embracing digital technology can significantly enhance student learning experiences[17]. The research explored optimal pathways for technology-education integration through a deep analysis of digital teaching practices. The research emphasizes that successful educational technology application requires balancing technological innovation with educational essence.

Demartini et al. demonstrated through research that human-centered approaches hold essential value in educational technology fields[18]. The

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research showcased how artificial intelligence improves adaptive learning through case analysis, emphasizing the importance of maintaining attention to and respect for people during technology application processes.

4.3 Technology Ethics and Data Privacy Protection

Against rapid technological development, XD Technology consistently places technology ethics and data privacy protection in essential positions. The company established comprehensive data protection systems, strictly complying with relevant laws and regulations to ensure user data security and privacy. In product design processes, the company consistently maintains "privacy-first" principles, minimizing data collection while ensuring all data usage receives users' explicit authorization and consent.

The company also established technology ethics committees to evaluate the ethical impacts of products and services, ensuring technological development consistently serves fundamental educational objectives. In artificial intelligence algorithm design and application processes, the company emphasizes algorithm transparency and fairness, avoiding potential bias and discrimination while ensuring all students can benefit equally from technological progress.

Miller emphasized the importance of public-private partnerships in education through research[19]. The research indicates that practical cooperation can combine public-sector educational missions with private-sector innovation capabilities, creating greater value for academic development. Sayffaerth's research emphasized prioritizing ethical considerations and data privacy in educational technology applications[20].

In artificial intelligence education application ethics research, Huang indicated that student privacy and data protection are key issues that digital-age educational development must address[21]. The research emphasizes that academic institutions and technology providers must establish strict data security measures to protect students' personal information from misuse or leakage. Huang's novel business model research also provides insights into school-based EEG attention training services, offering innovative approaches for implementing attention training technologies in educational settings[22].

5. Conclusions and Future Implications

5.1 Key Research Findings

The comprehensive analysis of XD Technology's human-centered management and marketing strategies yields several significant conclusions.

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First, user-needs-oriented human-centered strategies represent critical pathways for educational technology enterprises to achieve sustainable development. XD Technology gained widespread user recognition and market success through deep user insight and needs analysis, developing products and services that genuinely meet educational field requirements.

Second, organic integration of technological innovation with educational essence constitutes core elements of educational technology product success. While pursuing technological advancement, XD Technology consistently maintains education-centered principles, ensuring technology genuinely serves student comprehensive development and academic quality enhancement. This balance provides essential guidance for other educational technology enterprises.

Third, home-school-society collaborative ecological development models can maximize the creation of educational technology value. XD Technology formed educational synergy by constructing collaborative mechanisms involving schools, families, and society, improving product usage effectiveness, and promoting overall educational ecosystem optimization.

The results present the key performance indicators, including the 96% attention accuracy, user satisfaction rates, and other critical metrics. It provides a comprehensive view of XD Technology's success across multiple dimensions.

The key performance indicators are:

1. Attention Accuracy: 96% precision in real-time brainwave monitoring, comparable to medical-grade equipment.
2. User Satisfaction: 92% overall satisfaction rating across all stakeholder groups.
3. Learning Improvement: 85% of students showed measurable attention span improvements.
4. Technology Adoption: 88% successful integration rate in participating schools.
5. Parent Engagement: 78% active participation in home-based training programs.

These metrics demonstrate the effectiveness of XD Technology's human-centered approach in creating technology that performs well technically and achieves high user acceptance and educational impact.

5.2 Practical Implications for Industry and Policy

The research provides crucial practical insights for educational technology enterprises. Companies should establish user-centered product development systems through deep user research and needs analysis to develop products and services that satisfy educational requirements. Simultaneously, enterprises must find a balance between technological innovation and educational essence, ensuring technology genuinely serves educational objective achievement.

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For educational policymakers, the research demonstrates that through policy guidance and support, educational technology enterprises can better fulfill social responsibilities while promoting educational equity and quality enhancement. Governments should establish effective incentive mechanisms to encourage enterprises to invest more resources in educational public welfare and technology democratization development.

For educational practitioners, the research showcases the tremendous potential of technology-education integration. Teachers should actively embrace new technologies, enhancing technical application capabilities through professional training and practical exploration to provide better educational services for students.

5.3 Research Limitations and Future Research Directions

The research contains certain limitations that present opportunities for future investigation. First, the study primarily relies on single enterprise case analysis, providing depth but lacking breadth. Future research should expand sample ranges and conduct cross-enterprise and cross-regional comparative studies to verify the universality of the research conclusion.

Second, the research mainly focuses on short-term effects, requiring longer-term tracking for comprehensive impact assessment. Future research should establish long-term tracking mechanisms to analyze the influence of attention training on students' lifelong development in depth.

Finally, as technology continues to develop, new educational technology products and models constantly emerge, requiring continuous updating and improvement of related theories and practices. Future research should closely monitor technological development trends and promptly summarize new experiences and patterns to provide sustained theoretical support for healthy educational technology industry development.

In summary, XD Technology’s human-centered management and marketing strategy practices provide valuable Experience for educational technology enterprise development. Their explorations in technological innovation, educational equity, and social value creation hold crucial theoretical and practical significance. As educational digital transformation deepens, these experiences and models will provide important references for more enterprises and regions, promoting the sustained, healthy development of the educational technology industry.

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