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Empowering Disabled MSMEs through Technology Adaptation and Digital Marketing in Productivity Turnover

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Abstract. *Devan Bamboo, an MSME owned by an entrepreneur with a disability, faced a productivity–revenue paradox: a 170% increase in productivity was followed by a 26% decline in revenue. This occurred due to a mismatch between production output and market demand, limited access to wider markets, and the inability to produce high-value customized products using manual methods, alongside weak digital marketing. This community engagement program implemented an integrated empowerment model using Rapid Rural Appraisal (RRA) and Asset-Based Community Development (ABCD). RRA was used to identify operational bottlenecks, while ABCD guided solution design by leveraging the partner's existing creative strengths. The intervention included disability-adapted production technologies (bamboo cutting, splitting, and laser cutter machines adjusted for wheelchair use) and intensive digital marketing training (e-commerce, CorelDRAW, and Instagram strategy).*

The results showed significant improvements. Production efficiency increased, with over 50% of products adopting laser-cut designs. Digital performance rose sharply (Instagram reach +244%). Importantly, revenue trends recovered, with omzet increasing in Quarter III after previous decline. This study concludes that integrating adaptive technology and digital skills effectively aligns productivity with market demand, providing a sustainable empowerment model for disability-owned MSMEs.

Katakunci:
Aset-Based Community Development (ABCD); Kerajinan Bambu; Digital Marketing; UMKM; Teknologi.

Abstrak. Devan Bamboo, UMKM milik wirausaha difabel, menghadapi paradoks produktivitas–pendapatan: peningkatan produktivitas sebesar 170% justru diikuti penurunan omzet sebesar 26%. Kondisi ini disebabkan oleh ketidaksesuaian antara kapasitas produksi dan permintaan pasar, keterbatasan akses pasar yang lebih luas, serta ketidakmampuan menghasilkan produk bernilai tambah tinggi secara konsisten akibat proses manual dan pemasaran digital yang belum optimal. Program pengabdian kepada masyarakat ini bertujuan mengatasi permasalahan tersebut melalui model pemberdayaan terintegrasi menggunakan Rapid Rural Appraisal (RRA) dan Asset-Based Community Development (ABCD). RRA digunakan untuk mengidentifikasi permasalahan

secara cepat dan partisipatif, sedangkan ABCD berperan dalam merancang solusi berbasis potensi dan kreativitas mitra. Intervensi meliputi penerapan teknologi produksi yang diadaptasi dengan kondisi disabilitas (mesin potong, seset, dan laser cutter yang disesuaikan dengan penggunaan kursi roda) serta pelatihan pemasaran digital intensif (e-commerce, CorelDRAW, dan strategi Instagram).
Hasil menunjukkan peningkatan signifikan pada aspek produksi, pemasaran, dan finansial. Lebih dari 50% produk telah menggunakan desain laser-cut, jangkauan Instagram meningkat sebesar 244%, dan tren omzet berbalik meningkat pada Triwulan III. Studi ini menyimpulkan bahwa integrasi teknologi adaptif dan keterampilan digital efektif menyelaraskan produktivitas dengan permintaan pasar serta berkelanjutan dalam pemberdayaan UMKM difabel.

1 Introduction

This community service program is critically important because it addresses a real and urgent sustainability problem faced by a local disability-owned MSME, Devan Bamboo, located in Jombang, East Java. The enterprise experienced a severe productivity–revenue paradox: while production increased by 170%, revenue declined by 26%. This condition reflects a structural imbalance between production output, product value, and market access (Shen et al., 2022). The root causes include inefficient manual production processes, inability to produce high-value customized products at scale, and limited digital marketing capability(Vadivelu et al., 2025). If this problem is not addressed, the business risks long-term stagnation or even closure, which would not only affect the economic well-being of the owner and workers but also reduce opportunities for inclusive local economic development, particularly for persons with disabilities (Tiasakul et al., 2024a).

This program was conducted specifically at Devan Bamboo because it represents a high-impact local case with strong but underutilized potential. The business is led by Mr. Sukardi, a wheelchair user who has demonstrated proven creativity through his achievement as a 3rd place winner in the 2023 Krenova innovation competition. Despite this, his business remains constrained by physical production limitations and lack of access to adaptive technology. Compared to other

MSMEs, this partner was selected due to the intersection of three key factors: disability inclusion, local resource-based industry (bamboo craft), and a clearly measurable productivity–revenue gap. This makes the intervention not only relevant but also strategic as a model for similar MSMEs in comparable local contexts.

This community service consists of a single integrated intervention program implemented through stages of diagnosis, co-design, technology implementation, training, and mentoring. The novelty of this program lies in its integrated inclusive-digital approach, which differs from conventional MSME assistance models that tend to be partial and fragmented. First, the program introduces adaptive production technology (bamboo cutting, splitting, and CNC laser machines) that are specifically customized for wheelchair ergonomics, enabling independent and safe operation by the disabled entrepreneur. Second, it integrates digital capability development, including CorelDRAW-based product design, e-commerce optimization, and social media marketing strategies (Yaqin et al., 2025). Third, the program applies a co-design innovation approach, resulting in new products such as a modular bamboo handbag with a detachable strap system, which enhances product functionality and market value.

The key novelty is not only in the individual components, but in the integration of hardware adaptation, digital skills, and product innovation within a single intervention model specifically designed for a disability-owned MSME. This integrated model directly addresses the root cause of the productivity–revenue paradox by aligning production efficiency with market demand and value creation. Therefore, this study aims to demonstrate that such a holistic and inclusive approach is an effective and scalable strategy for strengthening the competitiveness and sustainability of local MSMEs, particularly those led by entrepreneurs with disabilities.

The objective of this community service program is to implement and analyze the effectiveness of an integrated empowerment model based on adaptive technology and digital skills in improving production efficiency, promoting market-driven product innovation, and strengthening the marketing competitiveness of disability-owned

MSMEs. In addition, this program aims to develop a practical and replicable empowerment model that can be applied to similar MSMEs in other local contexts.

2 Method

The methodology for this community engagement program was strategically designed to bridge traditional craftmanship and modern industrial standars through an inclusive lens, following a hybridized approach that combined the Asset-Based Community Development (ABCD) model with the Rapid Rural Appraisal (RRA) technique (Wijaya et al., 2024). This combination allowed the team to move quickly from diagnostic assessment to asset mobilization, with specific procedural modifications made to accommodate the physical requirements of a disability-led enterprise. The systematic progression of the intervention, spanning 9 intensive site visits over an 8 month period, is illustrated in the procedural flowchart below (see Figure 1.)

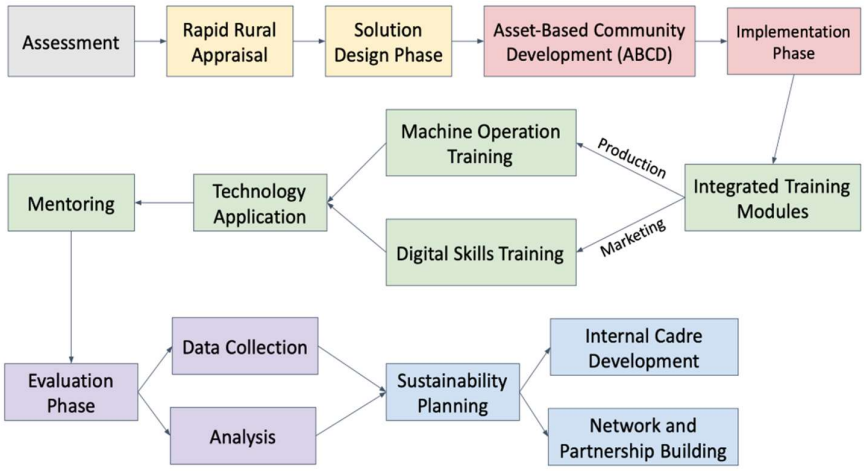

Figure 1. Flowchart of Community Engagement Program Implementation

The initial phase involved diagnostic assessment and asset identification using the Rapid Rural Appraisal (RRA) method. Through interviews and direct observations, the team identified the core issue of a productivity–revenue paradox caused by inefficient manual production. At the same time, the Asset-Based Community Development

(ABCD) approach was applied to map the partner's strengths, including creativity, experience, and prior innovation achievements.

The next phase focused on solution design through a co-design approach. The program developed an "inclusive-digital" roadmap consisting of two parallel components: production improvement and digital marketing enhancement. Marketing activities included product rebranding, digital content creation using accessible tools (e.g., Canva), and strengthening visual-based storytelling.

The implementation phase emphasized capacity building and technology adoption. Digital training covered e-commerce optimization and financial literacy using the SiApik application, enabling structured financial management and pricing strategies. In parallel, production capability was enhanced through CorelDRAW training and the introduction of adaptive technologies, including a CNC laser cutter customized for wheelchair ergonomics, as well as bamboo cutting and splitting machines. These interventions significantly reduced production time and improved product precision. The program also included product innovation through co-design, resulting in a modular bamboo handbag as a flagship product. To support market expansion, both digital promotion and offline display tools were provided. The final phase involved evaluation and sustainability planning, including monitoring production, marketing, and financial performance. A consistent digital marketing schedule and network development were established to ensure long-term business continuity and independence.

3 Results

The implementation of the integrated empowerment program at Devan Bamboo yielded transformative outcomes across 4 key performance indicators: production efficiency, production innovation, digital engagement and financial growth. By transitioning from labor-intensive manual methods to an automated, inclusive manufacturing model, the partner successfully reversed the previous 'Productivity-Revenue Paradox'.

The most immediate result of the technological intervention was the drastic reduction on time-to-market for bamboo-based products. The introduction of high-torque cutting and splitting machinery, alongside the Zaiku CNC laser cutting machine, allowed the partner to achieve precision that was previously impossible.

Table 1. Comparative Production Efficieny : Pre-Intervention Vs. Post-Intervention.

Production Activity	Manual Method	Automated Method	Time Reduction (%)
Cutting Large Bamboo (Petung)	480–600 Minutes/Pole	5–10 Minutes/Pole	-98.30%
Splitting/Stripping (Seset)	120 Minutes/Bundle	15 Minutes/Bundle	-87.50%
Product Engraving (Monogram)	2880–4320 Minutes (2–3 Days)	15–30 Minutes	-99.40%
Design to Vector Preparation	Hand Sketched (Physical Solder)	30–60 Minutes (CorelDraw)	Variable

The 99.4% - time reduction in engraving is particularly significant (see Table 2.). Previously, Mr. Sukardi spent up to 3 days manually soldering a single intricate design; the laser system now completes the same task with higher fidelity in under half an hour. This efficiency liberated approximately 90% of the partner's weekly labor hours, which were subsequently redirected toward other things.

The transition of Devan Bamboo's digital presence following the integration of smartphone photography and AI-assisted editing tools—specifically Canva, CapCut, and PixVerse AI—resulted in a comprehensive aesthetic and operational overhaul. Notably, the partner achieved a 100% consistency rate in maintaining a "One Instagram Story per Day" commitment, a stark contrast to the sporadic posting schedule observed pre-intervention. This newfound consistency was paired with a dramatic elevation in visual fidelity; the brand image shifted from utilizing dimly lit, cluttered workshop photos to presenting high-contrast, AI-enhanced product shots that communicate a premium brand identity.

The quantitative impact of this aesthetic shift was most evident in the performance of Instagram Reels content. One specific video showcasing the new laser-cutting process reached a total of 4,300 views, with a remarkable 80% of the audience consisting of non-followers. This indicates a high level of "virality" and algorithmic discovery within the artisan craft niche. Engagement quality was also exceptionally high; 93.1% of those who viewed the content proceeded to visit the Devan Bamboo profile, demonstrating a strong "hook" and interest in the brand story. (see Figure 4.)

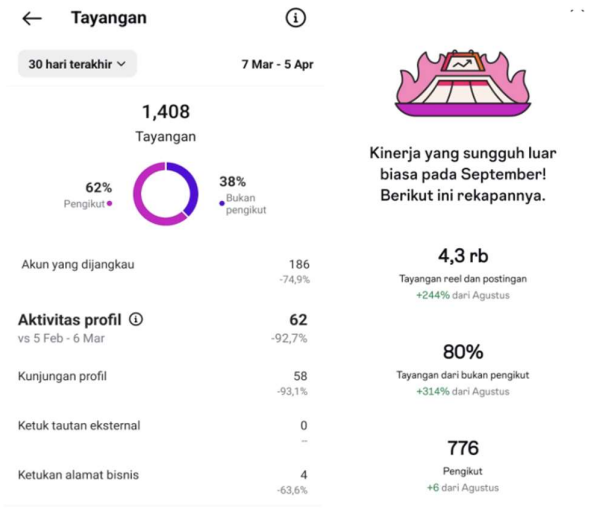

Figure 2. Comparison of Instagram Insights (Pre- and Post-Intervention)

Furthermore, the content acted as a direct driver for physical and digital inquiries, as 63.6% of profile visitors tapped the address button or contact link. Overall, the total profile reach for the intervention period was recorded at 186 unique accounts, representing a 74.9% increase compared to the previous quarter. Consequently, these improvements in engagement translated into tangible lead generation. The integration of "Direct-to-WhatsApp" links within the Instagram biography, coupled with the optimization of Shopee and Tokopedia storefronts, fostered a higher conversion rate, effectively turning casual digital followers into inquiring and purchasing customers.

The most critical indicator of success was the reversal of the declining revenue trend. By the end of Quartal III (July, August, and September 2025), Devan Bamboo recorded a revenue spike of approximately 15%. (See Table 3.)

Table 2. The progress of Devan Bamboo Omzet Growth

Bulan	Revenue	Growth
January	Rp.3.320.000,-	
February	Rp.1.930.000,-	-41.87%
March	Rp.1.750.000,-	-9.33%
April	Rp.1.000.000,-	-42.86%
May	Rp.4.817.000,-	381.70%
Juni	Rp.1.845.000,-	-61.70%
July	Rp.770.000,-	-58.27%
August	Rp.1.450.000,-	88.31%
September	Rp.5250.000,-	262.07%
Devan Bamboo Revenue/ Quarterly		
Quarterly I	Rp.7.000.000,-	
Quarterly II	Rp.7.662.000,-	9.46%
Quarterly III	Rp.8.050.000,-	15.00%

This growth is attributed to three factors: first, the reduction in production costs (COGS) due to lower labor hours per unit; second, the higher price point achieved by the new modular bags; and third, the elimination of outsourcing costs for laser services. Unlike the previous quarter, where high productivity did not translate to profit, the Q3 data shows a healthy alignment between production volume and sales

volume, indicating that the new marketing strategy successfully captured the demand generated by the increased production capacity.

A primary output of the program was the development of the "Modular Bamboo Sling-Handbag." This product represents a leap in bamboo craftsmanship, moving away from "souvenir-grade" items toward "fashion-grade" luxury goods. The innovation is centered on a proprietary detachable bamboo strap system.

The strap is engineered from small, interlocking bamboo segments that are treated for durability and high-gloss finish. Through a co-design process, the team and the partner developed a mechanism allowing the user to switch between a short shoulder-length strap (for formal handbag use) and a longer, adjustable strap (for casual sling-bag use). The precision of the laser cutter was instrumental in creating the consistent, micro-fitted joints required for the strap to be both flexible and strong. This modularity increased the product market value, as it effectively functions as 2 distinct fashion accessories in 1 (2in1) (see Figure 5.)

Figure 3. New Product Innovations

The culmination of the program's marketing and innovation efforts was showcased at the Jombang Festival. A key physical output of the intervention was the provision of a customized metal display rack, designed to be portable yet premium in appearance. (See Figure 6.)

Figure 4. New Display Rack at Jombang Festival 2025

Prior to the intervention, Devan Bamboo's exhibition presence was often cluttered, with products laid flat on tables, which diminished their perceived value. The new vertical display rack allowed for a curated presentation of the modular bags at eye level. This professional setup served as an "add-on value" that attracted high-profile visitors and potential B2B partners at the festival. The rack not only organized the space but also reinforced the brand's new identity as a sophisticated, technology-forward craft house. The feedback from festival attendees highlighted that the professional presentation made the products look like "premium boutique items" rather than "traditional market crafts," further justifying the 15% revenue increase observed in that period.

4 Discussion

The dramatic shift in production efficiency at Devan Bamboo—specifically the reduction of engraving time by over 99%—provides a significant empirical case study for the "technological breakthrough" theory in artisan MSMEs. Prior to the intervention, the partner was trapped in what literature describes as a labor-intensive trap, where high physical output does not correlate with economic growth due to the unsustainable cost of human capital per unit. As identified by (Anam et al., 2024) in their study on CNC implementation for woodcrafts, manual

processes in traditional industries often act as a ceiling for scalability. At Devan Bamboo, the transition from manual, solder-based pyrography to Zaiku CNC Laser automation effectively shattered this ceiling.

This result aligns with the findings of (Anooja & Kumar, 2025), who argue that the adoption of digital fabrication allows rural artisans to move past the limitations of labor-intensive manufacturing. However, our findings go further by demonstrating that the type of technology matters significantly for inclusive entrepreneurship. By modifying the laser cutter's ergonomics for a wheelchair-using artisan, the program fulfilled the requirements of the CARE (Challenges-Adaptive Mechanisms-Results) model. This suggests that "adaptive work access" is the primary catalyst for turning productivity into revenue for entrepreneurs with disabilities(Tiasakul et al., 2024b). When the physical barrier is removed via technology, the artisan's creative potential is "unlocked," allowing for a transition from low-margin souvenir production to high-precision, high-value branding (Radanliev et al., 2024).

The quantitative success of Devan Bamboo's digital marketing—specifically the 4,300 views on a single Reel with 80% non-follower reach—can be analyzed through the lens of Visual Storytelling Theory and the Digital Aura of handmade goods. In the contemporary attention economy, traditional crafts often struggle with "commoditization," where they are perceived as generic (He & Timothy, 2024). However, the use of short-form video (Reels) to document the precision of the laser cutter acting on organic bamboo created a "tradition-modernity" narrative that effectively captured the "Digital Aura" of the product(Balzano & Marzi, 2024).

Visual-centric platforms like Instagram are the most effective channels for traditional crafts because they allow for Process-Based Branding (Chong, 2025). The high profile-visit rate (93.1%) following the Reels exposure indicates that the content was not merely "passive entertainment" but served as a High-Intent Trigger. In social media theory, this is known as the Conversion Funnel Optimization; the video acts as the "Top of Funnel" (Awareness), while the 63.6% address button tap rate represents a "Bottom of Funnel" (Action) success.

This result validates the research of (Ahmadi et al., 2026) regarding the "Phygital" (Physical + Digital) marketing strategy. The fact that the majority of the audience were non-followers proves that the Instagram algorithm prioritizes "technical-aesthetic" content—videos that show satisfying, precise movements like laser engraving. For Devan Bamboo, the technology was not just a production tool; it was a content engine. This synergy between hardware and software is what (Harto et al., 2025) describe as "Integrated Digital Literacy," where the entrepreneur learns to use technology both to make the product and to market the story of its making.

The development of the modular bamboo handbag with detachable straps represents a shift from "Functional Innovation" to "Symbolic Innovation." As identified by (Jannah, 2014), MSMEs must innovate to differentiate in a saturated market. However, more recent Scopus-indexed studies, such as (Safitri & Purwatiningsih Purwatiningsih, 2025), emphasize that for the creative industry, innovation must be market-driven.

The "modular" aspect of the bag addresses the modern consumer's need for versatility (a shoulder bag and a sling bag in one). From a social media theory perspective, this modularity is "highly shareable" and "demonstrable," making it perfect for video content (Mazza et al., 2023). The 15% revenue spike in Q3 (Triwulan III) is the direct financial manifestation of this innovation. By producing a "hero product" that utilized the precision of the laser (for the interlocking strap links) and the aesthetics of the bamboo, Devan Bamboo effectively moved from the Red Ocean (highly competitive, low-price souvenirs) to a Blue Ocean (unique, high-value fashion accessories). This move increased the Perceived Value of the brand, justifying a higher price point and leading to the observed increase in profit margins despite the increase in production volume.

The introduction of the Aplikasi Siapik (Bank Indonesia) and the subsequent generation of standardized financial reports represent a critical transition from "informal" to "formal" business management. Historically, MSMEs like Devan Bamboo suffer from financial opacity, where the owner cannot distinguish between personal and business

funds, leading to a distorted perception of profit. This phenomenon, often termed the "Cash-Flow Trap," was the primary contributor to the "Productivity-Revenue Paradox" observed in Q1 and Q2.

As argued by Harto et al. (2025), digital transformation is not limited to front-end marketing; it must include back-end operational literacy. The ability to calculate a precise Cost of Goods Sold (COGS) through the Siapik application allowed the partner to price the new modular bamboo bags accurately. This aligns with recent findings by Irjayanti and Azis (2023), who identified that financial digital literacy is a significant predictor of MSME resilience. At Devan Bamboo, the output was a measurable 15% revenue spike in Q3, which was not merely the result of selling more, but selling smarter. By understanding the margin improvements afforded by the laser cutter (which eliminated the cost of outsourcing), the partner could reinvest capital into raw materials, creating a virtuous cycle of growth. This empirical evidence supports the theory that financial transparency is the prerequisite for sustainable scaling in the craft sector.

The success at the Jombang Festival serves as a vital case study for Experiential Marketing Theory in the digital age. While the 4,300 views on Instagram provided the "Digital Reach," the physical interaction at the festival provided the "Sensory Validation." Bamboo products are inherently tactile; consumers often need to feel the texture and weight to justify a "luxury" price point.

The provision of the customized metal display rack was not a simple logistical aid but a strategic intervention in Visual Merchandising. According to (Mele et al., 2024), the "Phygital" strategy is most effective when the physical touchpoint mirrors the quality perceived online. Because the Instagram content had established Devan Bamboo as a high-tech, precise brand, a cluttered table-top display would have created cognitive dissonance for the consumer. The vertical, organized display rack ensured that the "symbolic value" created in the digital space was maintained in the physical space.

This conversion of physical traffic into brand loyalty is supported by Sanusi et al. (2024), who emphasize that for artisan crafts, the "Exhibition Experience" acts as the final stage of the trust-building

process. The 63.6% tap rate on the address button observed in the digital metrics manifested physically as high foot traffic at the festival booth. This synergy proves that modern MSME empowerment must be omnichannel—aligning production precision, digital storytelling, and physical presentation to capture the full economic value of the craft (Febriani et al., 2025).

Finally, the Devan Bamboo case offers a profound validation of SDG 9 (Industry, Innovation, and Infrastructure) and SDG 10 (Reduced Inequalities). The specialized ergonomic adaptation of the Zaiku CNC Laser table height is more than a technical fix; it is an act of Inclusive Innovation.

As theorized by (Alexander et al., 2024) through the CARE Model, the primary barrier for entrepreneurs with disabilities is often the "mismatch" between standard industrial tools and individual physical needs. Our results prove that when "Adaptive Mechanisms" are applied, the disability becomes irrelevant to the output quality. This aligns with the findings of (Abadi, R. F., 2024), who noted that digital technology acts as a "Great Equalizer" for marginalized groups. By enabling Mr. Sukardi to operate high-end CNC machinery independently, the program moved beyond traditional "charity-based" aid toward "capability-based" empowerment. This model suggests that the future of community engagement in Indonesia should focus on Digital-Inclusive Sinergy, where technology is customized to the human, rather than forcing the human to adapt to the machine.

5 Conclusion

In conclusion, this community engagement program demonstrates the challenges facing disabled bamboo MSMEs are systemic and require holistic yet multidimensional solutions. By effectively reversing the "Productivity-Revenue Paradox," the program proved that the strategic intersection of Technological Automation and Digital Branding leads to significant financial growth. This was evidenced by the 15% revenue increase recorded in Quartal III of 2025, a result that stands in stark contrast to the previous quarter's decline. The study confirms that for entrepreneurs with disabilities, technology acts as the ultimate catalyst

for economic independence. The successful adoption of Zaiku CNC Laser technology, paired with AI-driven marketing and standardized financial reporting via the Siapik application, transformed Devan Bamboo from a struggling local MSME into a competitive, technology-forward bamboo-craft brand.

A critical takeaway from this program is the role of product innovation. The creation of the "Modular Bamboo Bag" serves as a example to the fact that when manual production bottlenecks are removed, creative innovation can flourish. The precision afforded by the new machinery allowed for the engineering of a detachable strap system that elevated the product from a simple souvenir to a high-value fashion accessory. Furthermore, the program's success at the Jombang Festival highlights the importance of Visual Merchandising and physical touchpoints. The use of a customized metal display rack provided the "sensory validation" necessary to convert digital interest-represented by the 4,300 views on Instagram Reels-into physical sales and brand loyalty. This proves that an "omnichannel" approach is very essential for modern MSMEs to thrive.

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