

Digital Transformation Strategy to Enhance Consumer Trust in Apple Cider Vinegar Products through Quality, Legality, and Digital Education

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The growing popularity of apple cider vinegar (ACV) as a health supplement has led to a significant increase in market demand (Al-Semidee et al., 2023). However, this growth is accompanied by critical issues including misleading health claims, inconsistent product quality, and a lack of regulatory certification (Waktila & Antton, 2022). Moreover, many producers, particularly MSMEs, have yet to fully adopt digital tools that could help address these challenges, such as transparent online labeling, health education campaigns, and digital customer engagement strategies.

Some of the problems with this product are as per table 1.

Table 1. Issues with Apple Cider Vinegar

Issue	Problem
Health Issues (Side Effects)	Tooth enamel erosion: Due to its acidic nature, apple cider vinegar can damage tooth enamel if consumed directly without dilution. Gastrointestinal irritation: Consuming large amounts can cause stomach pain, nausea, or irritation to the stomach and esophagus.

Issue	Problem
	Decreased potassium levels: Long-term use has been reported to cause hypokalemia (low potassium levels).
	Drug interactions: Can interfere with the effectiveness of certain medications such as insulin or diuretics.
Product Quality Issues	Unsterile or unhygienic: Homemade or unpasteurized products can contain harmful bacteria. Unlabeled ingredients: Some products do not list acidity levels or are inconsistent with health standards. Unnatural additives: Some brands add artificial sweeteners or preservatives that actually reduce the natural benefits.
Regulatory Issues and False Claims	Exaggerated health claims: Many products claim to cure various diseases without adequate scientific evidence (Chen & Gusriyandina, 2024). Lack of clinical trials: Most claims of benefits have not been widely proven through large-scale scientific studies. Lack of BPOM supervision: Some local or home-made products do not have a distribution permit from the Food and Drug Supervisory Agency (BPOM / Badan Pengawas Obat dan Makanan) in Indonesia especially.
Consumer Education Problems	Lack of knowledge about safe dosage: Consumers often consume without knowing the right dosage. Not suitable for everyone: Consumers sometimes assume this product is safe for everyone, when in fact it is not suitable for people with ulcers or kidney disorders.

In the digital age, consumer trust is built not only on product effectiveness but also on how businesses communicate quality, legality, and safety through online platforms. This research explores how digital transformation strategically be applied to boost consumer confidence in ACV products (Sahardjo et al., 2023).

Research problems in this study are:

1. What is the current level of consumer trust in ACV products sold online?
2. How do quality assurance, legal certification, and digital education affect consumer trust?
3. What are the barriers for ACV producers in implementing digital strategies?
4. What digital transformation strategies are most effective in enhancing consumer trust?

Research objectives in this study are:

1. To examine consumer perceptions of ACV products in the digital marketplace.
2. To identify the role of quality, legality, and education in building trust.
3. To analyse the challenges faced by MSMEs in digitally transforming their ACV businesses.
4. To develop a digital transformation framework that enhances trust and business sustainability (Junaedi et al., 2024).

Significances of this research are:

1. Academic Contribution: Provides insights into the integration of digital strategy and trust-building in the health product sector (Dionelita et al., 2025).
2. Practical Application: Offers MSMEs a roadmap to transform their operations and increase market competitiveness through digital tools.
3. Social Impact: Promotes public health literacy and safe consumption through verified information online (Mukhlain et al., 2024), (Purwati et al., 2023).

LITERATURE REVIEW

Consumer Trust in Functional and Health Products

Trust plays a pivotal role in influencing consumer behavior, particularly in the domain of health-related products (Hadi et al., 2024). According to (Baker et al., 2022), consumers are more likely to purchase health supplements and functional foods when they perceive the brand as credible, safe, and transparent. Factors such as product certifications (e.g., halal, BPOM), quality consistency, and scientific backing contribute significantly to perceived trust (Sabita & Mandalis, 2023).

In the digital context (Renaldi, Junaedi, et al., 2024), trust becomes even more critical due to the inability to physically inspect products (Sasanti et al., 2024). Digital trust is reinforced through clear labeling, verified reviews, educational content, and visible certifications (Nasien et al., 2024), (Sasanti et al., 2025). These trust

signals reduce uncertainty and enhance purchase intention in online environments (Rerachio, Susanti, et al., 2024; Iriana et al., 2022).

3 Health Risks and Perceptions of Apple Cider Vinegar (ACV)

Apple Cider Vinegar (ACV) has been marketed as a natural remedy with multiple benefits, weight loss, improved digestion, blood sugar regulation, but its acidic nature raises health concerns. According to (Chang et al., 2020), excessive or improper consumption of ACV can lead to enamel erosion, esophageal damage, gastrointestinal discomfort, and potassium depletion (hypokalemia). Furthermore, conflicting information online may lead to consumer confusion or misuse.

These health risks necessitate clearer digital education and transparent product labeling to prevent misuse and to guide consumers toward safe consumption practices. Studies by (Fitpatrick, 2023) advocate for integrating health disclaimers and usage guides in digital marketing strategies to mitigate risk and enhance user responsibility.

Digital Marketing and Consumer Education

Digital marketing is not only a tool for promotion but also a platform for consumer education. Research by (De Cicco et al., 2025) highlights that in health-related product categories, educational content (e.g., how-to videos, infographics, blogs) significantly increases consumer engagement and trust. Informative and ethical content builds brand authenticity and encourages long-term loyalty.

Platforms like Instagram, Shopee Live, and TikTok are increasingly used to humanize brands and create interactive, trust-building narratives. However, SMEs often underutilize these platforms for education, focusing more on price promotion than guidance (Chandra et al., 2025). (Ayaz et al., 2025). Bridging this gap through digital transformation is a key competitive advantage.

2 Digital Transformation in MSMEs and Health Product Branding

Micro, small, and medium-sized enterprises (MSMEs) often face barriers in adopting digital transformation due to limited resources, technological know-how (Parwati et al., 2024), and regulatory knowledge (Moreira et al., 2025). However, digitization offers a scalable pathway to enhance brand trust, streamline product legitimacy, and improve customer experience.

Studies by (Jurnalita, 2024) confirm that digitally transformed MSMEs exhibit stronger market competitiveness, especially when supported by ecosystem enablers such as digital education platforms, e-commerce integration, and quality assurance systems (Sudarno et al., 2022). Implementing frameworks like the Business Model Canvas (digital adaptation) enables MSMEs to align their operations with trust-based value creation.

The Role of Legality and Certification in Building Digital Trust

Product legality, such as BPOM approval in Indonesia or FDA recognition globally, is a cornerstone of trust in functional food markets. In digital ecosystems, consumers often use legality indicators as filters for perceived safety and professionalism (Carl et al., 2023). Certifications such as halal, organic, and ISO GMP contribute not only to compliance but also to marketability in digital and cross-border contexts (Hidwati et al., 2025).

Without clear certification or safety disclosure, products risk being flagged, delisted, or discredited, especially on mainstream platforms like Shopee, Tokopedia, or TikTok Shop. Therefore, legal integration into product branding and platform visibility is essential.

6 METHODOLOGY

Research Design

This study uses a qualitative research approach (Creswell & Creswell, 2023) to explore how digital transformation strategies can enhance consumer trust in apple cider vinegar (ACV) products (Syahputra et al., 2022). The qualitative method is appropriate to deeply understand the perspectives, practices, and digital challenges faced by producers, especially micro, small, and medium enterprises (MSMEs), as well as to analyze the quality of digital communication and branding strategies used in the marketplace (Sekaran & Bougie, 2016).

Data Collection Methods

In-depth Interviews: Participants: ACV producers, especially those actively engaged in digital marketing and e-commerce platforms (Shopee, Tokopedia, Instagram, TikTok Shop). Sampling Technique: Purposive and snowball sampling, targeting 5–10 key informants with diverse digital engagement levels. Interview Focus:

Perceptions of product quality and safety. Legal compliance challenges (e.g., BPOM, Halal certification). Use of digital platforms for branding and consumer education. Trust-building strategies and obstacles in digital markets.

Digital Content Analysis (Nyono et al., 2023). Sources: Social media pages (Dharta & Marlita, 2020), e-commerce listings, and digital advertisements of selected ACV brands. Focus Areas: Product descriptions, imagery, and certifications, customer feedback and reviews, educational content on usage and health benefits, and transparency indicators (e.g., traceability, ingredient sourcing, legal declarations).

Analysis Tools

Thematic Analysis. Interview transcripts and digital content will be coded and analyzed thematically using manual coding or qualitative software tools (e.g., NVivo or ATLAS.ti). Emerging themes may include: "Digital trust signals," "Consumer misperceptions," "Regulatory barriers," "Transparency strategies," and "Digital education gaps."

Digital Business Model Canvas. The insights gathered will be translated into a Digital Business Model Canvas, adapted for ACV MSMEs. This canvas will help outline a strategic framework that integrates:

1. Value Proposition: Trustworthy, certified, and transparent ACV products
2. Customer Segments: Health-conscious digital consumers
3. Channels: Social media, marketplaces, brand websites (Renaudo et al., 2021)
4. Customer Relationships: Digital engagement, education, responsiveness
5. Key Activities: Legal compliance, quality control, content creation
6. Key Resources & Partnerships: Regulatory bodies, influencers, tech support
7. Revenue & Cost Structure: E-commerce revenue, digital campaign expenses, certification costs

Expected Outcome of the Methodology

The qualitative approach aims to:

1. Uncover deep-rooted challenges and opportunities for ACV producers in building trust digitally.
2. Generate actionable insights for improving product transparency, legality, and digital education.
3. Deliver a practical, adaptable digital strategy model based on real producer experiences and digital practices.

RESULT AND DISCUSSION

Lack of Standardized Quality Assurance Across Producers

Interviews with ACV producers revealed significant variability in production standards (Putri et al., 2024). While some producers followed Good Manufacturing Practices (GMP) and used standardized fermentation methods, others admitted to lacking clear procedures due to limited technical knowledge and capital. This inconsistency reflects poorly on perceived product quality.

Consumers buying ACV online often rely on indicators such as packaging, testimonials, and influencer endorsements to assess quality. However, without certifications or transparent production narratives, trust is fragile. Digital transformation efforts must prioritize standardizing quality practices and using storytelling to showcase quality in a traceable, visual, and credible way (e.g., behind-the-scenes videos, verified certifications).

Legality and Certification as a Barrier for MSMEs

Most MSME producers had limited understanding of legal compliance procedures, particularly BPOM registration and halal certification. Some found the process was costly, complex, and bureaucratic.

Legal recognition is a major trust driver in health products. In digital platforms like Shopee or Tokopedia, products with clear legal labeling (e.g., BPOM number, halal logo) are more likely to be prioritized in search results and trusted by consumers. Therefore, capacity-building programs and digital onboarding support from health authorities or platform partners are essential. Platforms can also implement "Verified Seller for Health Products" badges to help filter trustworthy sellers.

Digital Education is Largely Missing from Marketing Strategies

While producers are active on Instagram, TikTok, and marketplaces, their content mainly focuses on pricing and promotions. Few provide educational content on ACV benefits, safe consumption methods, or differentiation from synthetic vinegar.

Digital education is a strategic yet underutilized tool in building consumer trust. Content that is educational, such as infographics on health benefits, expert interviews, or video testimonials, can demystify the

product and empower consumers. Producers who integrated informative content experienced better engagement and more repeat customers.

This supports prior research emphasizing the role of "content marketing as trust architecture" in the digital health product space.

Trust Signals in Digital Channels Are Underutilized

Digital content analysis showed that many ACV listings lacked basic trust-building elements, such as:

- 1. Certification logos
- 2. Verified user reviews
- 3. FAQ or usage guides
- 4. Transparent ingredient lists

In a low-touch digital environment, trust must be designed intentionally. Features like traceability links (e.g., batch number lookups), real-time customer service via WhatsApp, or a verified social media presence are vital. Embedding these into platforms like Shopee Live or Instagram Stories can significantly increase purchase confidence.

Strategic Framework: Digital Business Model Canvas for ACV MSMEs

Based on the above findings, the following Digital Business Model Canvas is proposed:

Table 2. Digital Business Model Canvas

Component	Description
Value Proposition	High-quality, certified, and educationally transparent ACV products
Customer Segments	Health-conscious digital natives, organic lifestyle adopters
Channels	Instagram, Tokopedia, Shopee, TikTok Shop, official website
Customer Relationships	Engagement through education, reviews, and direct Q&A
Revenue Streams	E-commerce sales, subscription models, bundled health products
Key Resources	Certified production, digital content team, influencer network
Key Activities	Legal registration, quality control, video content creation, digital marketing
Key Partners	Health regulators (BPOM), marketplace platforms, health influencers
Cost Structure	Certification costs, platform ads, packaging, content production

Product Safety Challenges and Strategic Solutions

Table 3. Solution for Some Problems with Apple Cider Vinegar

Problem	Cause	Solution	Information
Tooth Enamel Erosion	ACV is highly acidic (acetic acid), which can erode enamel over time if consumed undiluted.	Product Reformulation	Introduce pH buffering agents, such as calcium carbonate or magnesium hydroxide, to slightly reduce acidity without compromising effectiveness. Develop a ready-to-drink (RTD) diluted version of ACV with added flavor and natural sweeteners (e.g., stevia, honey) to improve palatability and reduce acid impact.
		Packaging Innovation	Offer the product in pre-measured sachets or effervescent tablets, designed to be mixed with water (Renaldi, 2021).
		Digital Education	Include in product content: "Consume diluted with at least 200 ml of water; do not drink directly." Infographics/video content: "Protect your smile, always dilute your vinegar."
Gastrointestinal Irritation	High acidity may irritate the stomach lining.	Add Soothing Ingredients	Blend ACV with aloe vera extract, ginger, or mint, known for soothing digestive effects.

Problem	Cause	Solution	Information
	especially when consumed on an empty stomach.		Develop a "Digestive ACV Blend" targeting gut health with a softer impact.
		Encourage Correct Usage	Educate consumers to take ACV after meals or with food. Use QR codes on packaging linking to video instructions on safe usage.
Decreased Potassium Levels (Hypokalemia)	Long-term consumption may reduce potassium levels in the body.	Fortify Product	Add potassium-rich natural sources, such as banana extract, coconut water powder, or electrolyte blends to the formulation. Alternatively, include a disclaimer: "Not for long-term daily use without physician supervision."
		Smart Consumption Reminder	Use a mobile app or chatbot integration that sends reminders or health tips (e.g., "Take a break after 14 days of continuous use.")
Drug Interactions	ACV can interfere with insulin, diuretics, and heart medications.	Clear Warning Labels	Include a "Health Advisory" on the product: "If you are taking medication for diabetes or heart conditions, consult your doctor before use."
		Interactive Digital Tools	Develop an AI-powered self-checker on your website or app where consumers can select their condition and get personalized advice.

Final Product Innovation Suggestions

Table 4. Product Innovation

Product Variant	Key Additives	Function	Target Consumer
ACV Effervescent Tablet	Electrolytes + Mint	Reduces acidity, easy mixing	Active individuals
ACV Digestive Blend	Ginger + Aloe Vera	Soothes stomach	Sensitive stomachs
ACV Daily Shot	Coconut Water + Stevia	Maintains potassium, gentle	Long-term users
ACV Smart App Companion	QR Code + Tips	Digital guidance, safety education	All users

CONCLUSION

Conclusion

This study highlights the critical role of digital transformation strategies in building and enhancing consumer trust in apple cider vinegar (ACV) products, especially those marketed online by MSMEs. Findings from interviews with ACV producers and analysis of their digital marketing content reveal that lack of transparency, unclear health guidance, absence of certifications, and limited consumer education are major barriers to trust.

By adopting a digitally adaptive Business Model Canvas, MSMEs can realign their operations to emphasize product quality assurance, legal compliance (GPOM, label, etc.), and educational engagement with consumers. This transformation not only addresses safety concerns (e.g., enamel erosion, gastrointestinal irritation, drug interactions) but also positions brands for long-term digital competitiveness.

Implication

For MSMEs, digital transformation is not merely about technology adoption but about reshaping business models to deliver trust and transparency (Ranaldo et al., 2022), especially in health-sensitive products like ACV. For Consumers, digitally educated consumers become more discerning and loyal, especially when they can access safety information, usage guidance, and verify product legitimacy online. For Regulators, there is a need to promote awareness and incentives for legal certification (BPOM, halal) among small producers who distribute ACV products via online marketplaces. For Platforms (e.g., Shopee, Tokopedia, Instagram), enhanced product verification and educational tools should be integrated into seller dashboards to encourage responsible health product marketing.

Limitation

Qualitative Focus: The study primarily relies on qualitative data (interviews and content analysis), which may limit generalizability across all ACV producers or markets. **Geographical Scope:** Research was limited to Indonesian MSMEs, which may not reflect the behavior of ACV producers or consumers in other regions. **Consumer Perspective Excluded:** Due to the qualitative nature of the study, direct consumer insights were not quantitatively validated in this version.

Recommendation

Integrate Natural Buffer Ingredients: To reduce health risks such as enamel erosion or stomach irritation, producers can consider adding natural pH buffers (e.g., aloe vera, honey, or fiber) to their ACV formulations. **Certify and Display Legality Clearly:** Secure BPOM, halal, and food-grade certifications, and make them visible in digital channels. This boosts legitimacy and trust. **Develop Educational Campaigns:** Use digital tools (short videos, infographics, live streaming) to educate consumers on safe consumption, dosage, dilution tips, and interaction with medications. **Adopt the Digital Business Model Canvas:** Producers should rethink their value proposition, channels, and key activities using digital adaptation frameworks for MSMEs.

Future Research

Future research should combine qualitative insights with quantitative surveys or SEM-PLS modeling to validate the effect of digital strategies on trust and purchase intention. Explore how different digital trust signals (e.g., reviews, certifications, influencer endorsements) influence ACV purchase behavior. Conduct cross-country comparisons of ACV branding, safety regulation, and digital marketing to explore global best practices. Study the effects of adding natural buffers or creating new formulations on both health safety and market acceptance.

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