

The Key Factors of Watching Live Streaming in Taiwanese Manufacturing Sectors Identified by the Analytic Hierarchy Process [†]

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Abstract: Live streaming has become an emerging business with a firm performance. We investigated the key factors that attract audiences to watch live streaming in the Taiwanese manufacturing industry. Nine experts in manufacturing and social media marketing participated in this study. The analytic hierarchy process (AHP) was employed to evaluate the key factors. Three main determinants were determined as a result, including audience motivation, pricing, and branding, each of which was further divided into three sub-factors. Consequently, the results revealed that the most essential factors of these three clusters were social aspects, brand design, and business trend analysis. The results also allow for an understanding of how traditional manufacturers have utilized live streaming to promote products and engage with their audience. These findings serve as a reference for Taiwanese manufacturers to incorporate live streaming into their business promotion strategies.

Keywords: live streaming; manufacturing sector; digital marketing; AHP



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1. Introduction

People receive information through a variety of means as the Internet ecosystem continues to evolve. As a burgeoning industry, live streaming is experiencing the most rapid growth. Live streaming for online shopping has emerged as a popular marketing approach in various businesses, drawing most of its traffic from influencers producing products by live streaming. Live broadcasters use their platform to promote and encourage buyers to try the products they recommend [1]. Initially, the live broadcast presenter focused on product advertising, which led to customers having a negative experience with the product or being emotionally influenced, causing ambiguity in their decision-making. When making a purchase, consumers weigh between assurance and risk [2]. Recognizing these drawbacks, manufacturers have turned to live streaming to enhance authenticity, build customer trust, reduce uncertainty, improve brand reputation, and boost sales [3]. The growing interest of modern consumers in eco-friendly materials has led upstream manufacturers to educate consumers about the use of green products, giving rise to the concept of the green supply chain [4,5].

When the COVID-19 outbreak surged in late 2019 and early 2020, numerous places had to implement epidemic prevention measures [6]. All industries were affected, causing a significant disruption to the globalized infrastructure supporting the expansion of industrial chains [4]. Subsequent epidemic prevention measures and quarantine, alongside supply chain disruptions and other factors, led to drastic changes on both the demand and supply sides [7].

Audiences are drawn to live streaming due to social trends, information acquisition, and attractive product visual design. This form of communication is a novel approach that organizations employ for effective interactions with customers and consumers. Such direct communication yields valuable audience input essential for the business [8–10]. Moreover, analyzing the market, consumer objectives, and business products is pivotal for manufacturers aiming to compete more effectively [5]. Through consumer and live streaming viewer interactions, manufacturers can understand competition. Meanwhile, manufacturers gain by pioneering or initiating trends. Manufacturers effectively delineate their strengths, limitations, opportunities, and challenges, introducing the most competitive products to the market [10–13]. The source of the product and brand promotion hold immense importance, constituting a pivotal component of the brand's marketing strategy. Product promotion plays a significant role in enhancing brand recognition among potential consumers and in nurturing customer relationships through promotional activities or live streaming mini-games [11,14,15].

In this study, we identified and evaluated the important factors influencing live streaming deployment in the manufacturing industry. For this, we investigated what factors arise from the existing literature on live streaming uptake in manufacturing and the important factors to consider to establish live streaming in the manufacturing industry. The characteristics of key factors in the live streaming of the manufacturing industry were identified by the literature analysis and expert interviews. Criteria were determined to design surveys. We employed an analytic hierarchy process (AHP) to comprehend numerous factors and provide a precise direction for the manufacturing industry to perform live streaming in the future.

2. Literature Review

Live streaming is one of the most popular e-commerce sales strategies, significantly shaping both consumers' purchasing behavior and corporate management. It involves the real-time transmission of audio and video content over the Internet [16]. The interactive nature of live streaming allows hosts to engage directly with the audience [17,18]. This form of communication has recently become a fundamental component of e-commerce. With the escalating prevalence of live streaming for shopping, a growing number of manufacturers are establishing channels to directly engage with customers or seek out new agents [16]. Many manufacturers are broadening their reach, integrating live streaming to enhance sales and to bolster consumer understanding of products and brands [19,20].

The impact of live streaming shopping on consumers' purchase intent is significant. Factors such as authenticity, visual appeal, product pricing, design, and authentic engagement have been demonstrated to significantly influence consumers' purchasing decisions [21]. The credibility, impact, and professionalism of the host positively shape customers' buying intent [22]. Hence, live streaming merges the perspectives of hosts and consumers on product quality, enabling manufacturers to refine their optimal strategies [20,23].

In terms of the production industry, live streaming channels exhibit characteristics such as commission rates, fixed fees, and specific fan quotas, alongside unique sales channels or contracts. The potential profitability and advantages of live streaming prompt numerous manufacturers to eagerly initiate their live streaming channels [24]. The competitive intensity concerning pricing, channel market share, and commission rates predominantly shape the sales strategy. Manufacturers establishing direct sales channels yield higher profits for the company [25].

Current research focuses on live streaming by consumer influencers or celebrities. However, we explored aspects of live streaming in the traditional production industry. While previous research was conducted to explore the efficiency of live streaming and the commissions paid by producers to marketing manufacturers, our study delves into the factors that influence live streaming methods in product promotion for production businesses (see Figure 1 and Table 1).

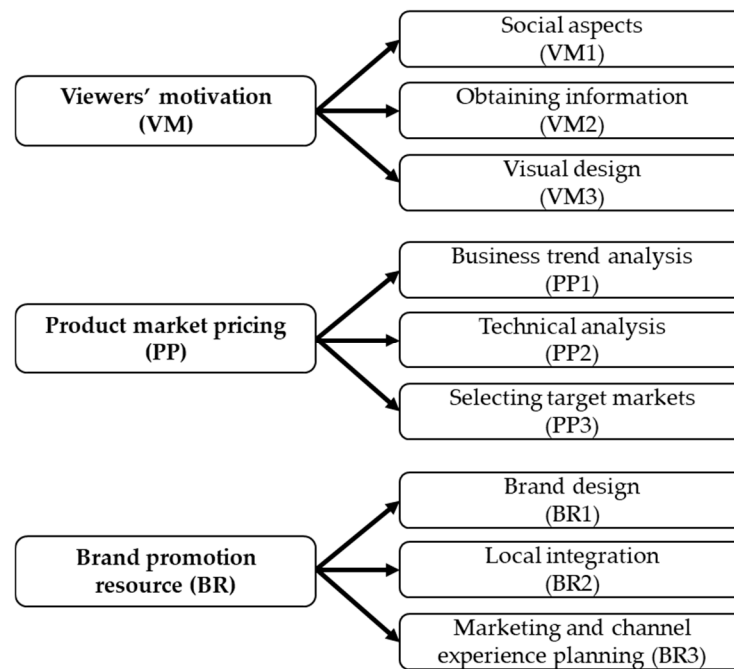


Figure 1. Proposed research model.

Table 1. Identification of critical factors and sub-factors.

No.	Code	Barriers	Description	Reference
Viewers' motivation to watch live streaming (VM)				
1	VM1	Social aspects	Satisfy and gain social support through live streaming platforms	[8]
2	VM2	Obtaining information	Get new knowledge through live streaming platforms	[9]
3	VM3	Visual design	Viewers and live streaming manufacturers can interact, exchange information, and conduct online teaching	[10]
Product market pricing (PP)				
1	PP1	Business trend analysis	Enterprises have a grasp of the latest business innovation directions and context. What these refer to are trends like benchmark cases and overall industry trends	[13,23]
2	PP2	Technical analysis	Collect the cross-field technologies required by enterprises when conducting design innovation to understand the implementation methods and feasibility of innovation	[12,26]
3	PP3	Selecting target markets	Strengthen the interactivity of the market, and sociality contributes to the concept of one-to-one marketing	[11]
Brand promotion resource (BR)				
1	BR1	Brand design	Brand design in a broad sense includes strategic design, product design, and image design. Corporate image design is an aspect of brand design, and its connotation is relatively broad	[15,27]
2	BR2	Local integration	Integrate locally related resources, materials, workforce, expertise, etc. to assist in product manufacturing, sales, promotion, etc.	[14]
3	BR3	Marketing and channel experience planning	Mainly through understanding the positioning of current competitors and overall channel analysis, we develop channel-specific brand strategies, so that the marketing strategy can be fully realized in stores. Channel strategy includes distribution, price, and promotion	[28,29]

3. Research Method

3.1. AHP

The AHP is a multi-criteria decision-making tool developed by Saaty (1990), widely used in domains such as economics and politics [30]. It is a measurement method that uses pairwise comparisons and relies on expert judgment to provide priorities. The AHP method stipulates that a given problem is hierarchically decomposed and partially solved, and then the partial solutions are combined to obtain the solution to the original problem [30,31]. The subjective decision-making process can be formalized through a hierarchical structure, leading to more accurate decision-making [30]. Thus, ensuring consistent decision-making judgments is vital. Breaking down the problem into sub-problems provides a better understanding [32,33]. Comparisons are made by the team or through an iterative procedure until all team members reach an agreement (presented in Table 2). Before finalizing a decision, a sensitivity analysis is conducted to evaluate the data [30,33].

Table 2. Saaty’s basic scale.

Intensity of Importance	Definition
1	Equal importance
3	Moderate importance
5	Strong importance
7	Very strong importance
9	Extreme importance

3.2. Questionnaire Design and Survey

The analytic hierarchy process was conducted to assess each component based on the relative importance of paired factors, comparing and judging them based on different facets. The descriptions below cover the purpose of the questionnaire design; its content, revising status, and survey objects; and the methodology for the questionnaire analysis. Each element at every level is an evaluation standard for pairwise comparisons in the content design. The questionnaire on a scale of 1 to 9, designed for professionals and scholars, was distributed via email for assessment. Invited experts completed the questionnaire, and the data were analyzed for multiple pairwise comparisons. The Expert Choice 2000 software was used to calculate the eigenvalues, eigenvectors, and the essential matrix with each ratio. The respondents for this questionnaire comprised executives from manufacturing and digital marketing manufacturers, showcasing their extensive expertise in manufacturing and their ability to effectively evaluate critical aspects in manufacturing live streaming.

4. Result and Discussion

4.1. Ranking

The weight of the “Manufacturing Live-streaming Evaluation Scale” was calculated based on the overall structural weight. Table 3 shows the weights and rankings of the scale components in this study.

Table 3. Ranking of factors.

Factor	Weight	Relative Ranking
Viewers’ motivation to watch live streaming (VM)	0.649	1
Product market pricing (PP)	0.247	2
Brand promotion resource (BR)	0.104	3

The relative importance of the factors was determined through the previously established hierarchical evaluation framework using the AHP questionnaire. The Expert Choice 2000 was used to calculate the weight and consistency of each level of the questionnaire and obtain the index weights of each evaluation aspect, as shown in Table 4.

Table 4. Weights and evaluation index of factors.

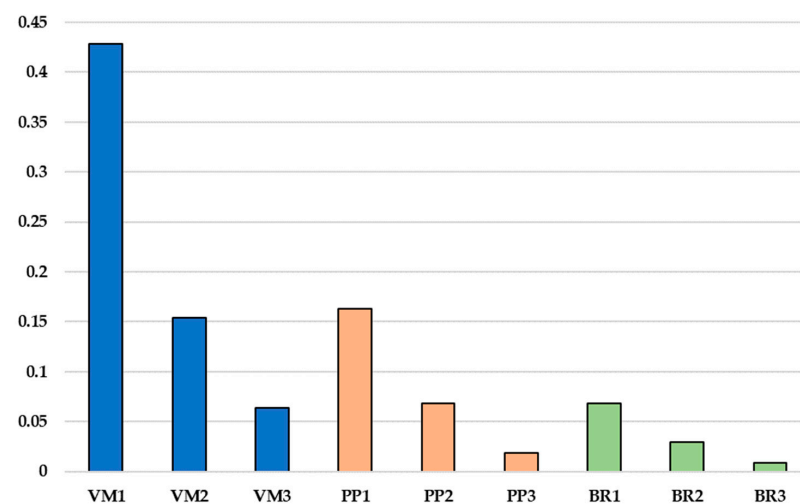
Code	C.R	Decision
VM	0.030	Accept
VM1	0.001	Accept
VM2	0.003	Accept
VM3	0.004	Accept
PP	0.009	Accept
PP1	0.005	Accept
PP2	0.006	Accept
PP3	0.007	Accept
BR	0.010	Accept
BR1	0.009	Accept
BR2	0.008	Accept
BR3	0.001	Accept

4.2. Discussions

To recognize the need, the manufacturing industry must adapt its business practices for the next generation. Apart from improving performance, industry leaders must prioritize the integration of new technologies to set the pace as a model for future manufacturers. The most essential critical criteria for manufacturing live streaming were “Viewers’ motivation to watch live streaming,” “product market pricing,” and “brand promotion resources.” The most essential characteristics of “Viewers’ motivation to watch live streaming” were “social aspects”, “brand promotion resources”, “brand design”, product market pricing”, and “business trend analysis” (presented in Table 5). The convenience that consumers obtain from retailers’ live marketing efforts benefits merchants in a variety of ways (Figure 2). The ability to live stream shopping activities on e-commerce platforms is widely valued [8–10]. Product strategies and business trends used by corporations to deliver benefits and economic benefits to manufacturers are significant, and manufacturers must develop their plans precisely [14,15].

Table 5. Factor weighting and ranking.

Sub-Factor	Weight	Overall Weight	Ranking
VM1	0.663	0.428	1
VM2	0.238	0.154	3
VM3	0.099	0.064	6
PP1	0.652	0.163	2
PP2	0.271	0.068	4
PP3	0.077	0.019	8
BR1	0.647	0.068	4
BR2	0.271	0.029	7
BR3	0.081	0.009	9

**Figure 2.** Overall weight ranking of all sub-factors.

COVID-19 has significantly disrupted the operations of numerous industries, leading to the cancellation or postponement of large-scale marketing initiatives and exhibitions. Global supply networks and essential industries have been significantly affected, posing new operational challenges for many small- and medium-sized businesses [7]. This crisis has changed people's purchasing habits from physical to online shopping. To address the challenges posed by the pandemic, many companies have embraced live streaming as an emergent business activity [4,34]. Traditional manufacturing industries have transitioned into providers of manufacturing services. Leveraging live streaming platforms, these industries are exploring new business formats and models to facilitate transformation and upgrading [21]. By investigating the factors of manufacturing live streaming, the result of this study provides a reference for the future development of the manufacturing industry in the direction of live streaming.

5. Conclusions

Online live streaming has emerged as a new and pivotal business activity. In this study, the most effective approach for the manufacturing industry was identified to offer a framework for manufacturing live streaming. The results assist enterprises in mitigating operational blind spots and maximizing commercial rewards. We prioritized the variables of utmost importance, such as "selecting target markets", "marketing and channel experience planning", "business trend analysis", "information acquisition", "local integration", "visual design", "technical analysis", "brand design", and "social aspects". The global epidemic has significantly impacted industries and hindered economic development and the mid- and long-term business goals of manufacturers. Smart manufacturing mitigates losses during this struggle. Manufacturers face significant challenges when the global economy becomes unstable. By adapting and investigating the factors in this study, future research and exploration can be directed. Future research is necessary to include big data, artificial intelligence, cloud computing, and Taiwan's industrial transformation. Then, updated theoretical foundations and practical guidelines can be acquired. The factors of new business activities for traditional manufacturing industries are used for reference. Based on the research findings, the following practical applications are proposed for traditional manufacturing manufacturers.

The professionalization of enterprise's live streaming and the enhancement of the ecosystem are demanded. Live streaming needs to be refined for professional operations, accompanied by a comprehensive industrial chain. To prevent content homogeneity, platforms must differentiate themselves using product and format innovations. Strengthening the anchor ecosystem's construction bolsters platform advantages to gain a competitive edge and win users in a fiercely competitive environment. Various live streaming application scenarios are evolving as the live broadcast market is increasingly segmented and vertically developed, spanning multiple industries such as finance, education, training, and medical care. These scenarios for larger companies are categorized into internal and external services. Internally, companies can utilize live streaming for corporate training, expert lectures, and internal meetings, prioritizing privacy and interaction in the live streaming environment. Externally, the company needs to leverage live streaming technology for marketing in seminars, meetings, events, and exhibitions. In addition to using reliable technical services, a significant focus needs to be put on content promotion and traffic direction to aid businesses in retaining existing clients and attracting new customers. For small- and medium-sized organizations, live video services are emphasized in marketing activities, leveraging public and private traffic sources to promote their activities, empower enterprise development, and achieve traffic conversion.

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