

A Study of the Relationship of the Utilization of Mobile Transmission Technology Devices and the Business Performance of Pioneer Media Company for Sporting Events Broadcasting

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Abstract: This study aims to explore the relationship of the utilization of MTT devices and the business performance for sporting events broadcasting. It is a quantitative descriptive correlational design to address the relationship of the utilization of MTT devices and the business performance for sporting events broadcasting of Pioneer Media Company in China. The researcher finds that there is a significant positive correlation between utilization levels and various business performance indicators. It is recommended to optimize and enhance the utilization of these facilities and services for media companies to drive continuous growth in business performance.

Keywords: mobile transmission technology (MTT), MTT devices, sporting events broadcasting, business performance, sport media company

1. INTRODUCTION

With the rapid development of technology, the application of mobile transmission technology in various industries has become increasingly widespread, especially in the fields of media and broadcasting. In the past, television and radio signals were mainly transmitted through terrestrial broadcasting, cable television, and satellite. Although these traditional signal transmission methods are reliable, they have many limitations in terms of flexibility, coverage, and cost. With the progress of Internet and wireless communication technology, mobile transmission devices came into being, providing more efficient and flexible solutions for information transmission.

Mobile transmission technology refers to the technology used to transmit information such as data, voice and video in wireless environment[1]. This kind of technology is mainly used in mobile communication systems, such as mobile phones, tablet computers and other mobile devices, to realize wireless communication between devices. Mobile transmission technology involves many aspects, including signal transmission, data coding, modulation and demodulation, wireless spectrum management, antenna design and so on. These technologies transmit data between the sender and receiver by radio waves, and usually use relay devices such as base stations, routers or satellites to enhance signal coverage and stability.

Mobile transmission technology devices refer to various devices and technologies that can efficiently and stably transmit information between different locations [2]. These devices and technologies mainly include the following categories: encoders, signal transmitters, modems, wireless transmission devices, satellite communication devices, portable batteries and charging equipment, adapters, data storage devices, and video transmission devices. Nowadays MTT devices have increasingly played a crucial role in sports media companies. These devices not only improve the

efficiency and quality of information transmission, but also significantly reduce operating costs compared to renting expensive transmission satellites, giving the company an advantage in fierce market competition.

The development of mobile transmission technology is driven by technological innovation. The continuous advancement of wireless communication technology, such as the popularity of 4G and 5G, has significantly improved the speed and reliability of data transmission. With the popularization of smart devices and the increasing demand for high-quality and diversified content from users, the mobile transmission industry has ushered in an opportunity for rapid development. Especially in the field of sports media, the audience's demand for real-time and high-definition event broadcasting has greatly promoted the development and application of mobile transmission technology.

The broadcasting industry is being transformed by mobile transmission technology, which enables for real-time visual broadcasting anywhere with internet or cellular connectivity. From the top suppliers of MTT devices, TVU and LiveU are leading the revolutionary change, as they are the world's leading mobile transmission technology devices. TVU specializes in developing real-time visual transmission solutions using Internet Protocol (IP), offering broadcasters various products to capture and broadcast live, high-definition content from anywhere in the world. LiveU, known for its portable live video transmission over cellular and IP networks, caters to a wide range of clients in sports, news, and entertainment sectors.

As sport media companies seek to enhance their mobile transmission capabilities, there is a growing demand for innovative technology solutions and advancements. Institutions and companies specializing in mobile transmission technologies can capitalize on this demand by developing cutting-edge products and services, fostering growth and innovation within the tech industry. This

symbiotic relationship drives technological progress and creates new business opportunities in the intersection of sports media and technology. This study aims to explore the relationship of the utilization of MTT devices and the business performance for sporting events broadcasting of Pioneer Media Company in China. The research questions are as follows:

RQ1: What is the level of the utilization of MTT devices for sporting events broadcasting of Pioneer Media Company, in accordance to hardware facilities, software facilities, and after-sale services?

RQ2: 2. What is the level of business performance for sporting events broadcasting of Pioneer Media Company, in accordance to gross profit margin, operating margin, and return on assets?

RQ3: What is the relationship of the utilization of MTT devices and the business performance for sporting events broadcasting of Pioneer Media Company?

2. LITERATURE REVIEW

The financial success of a media company is influenced by mobile transmission technology and sporting events broadcasting. The upcoming literature review will delve into crucial ideas and previous scholarly works that examine the relationships between mobile transmission technology, sporting events broadcasting, and the media company's business performance.

2.1 Mobile Transmission Technology

The broadcasting sector has been undergoing a significant transformation due to advancements in mobile transmission technology. This technology now permits real-time visual broadcasts to be transmitted from any location with an internet or cellular connection, ultimately influencing the financial performance of media companies.

The development of mobile transmission technology has undergone tremendous changes from wired to wireless, from analog to digital, and from low speed to high speed. At the end of the 20th century, digital television and broadcasting technology gradually replaced analog technology. Digital signal transmission not only improves transmission quality, but also increases channel capacity and reduces bandwidth requirements. The rise and vigorous development of the Internet has brought new ways of data transmission. Data transmission through the Internet is no longer restricted by geographical location, greatly improving the flexibility of transmission.

Mobile transmission technology provides strong technical support for media management. By using advanced technologies such as mobile Internet and 5G, media can more efficiently disseminate information, attract users and expand business [3]. In addition, the development of mobile transmission technology has also driven innovation in media business models [4]. For example, by developing mobile applications, conducting live streaming sales and other emerging business forms, media can further expand their revenue sources and enhance their profitability. In addition, the popularity of mobile transmission technology enables media to expand their market more conveniently [5].

While mobile transmission technology has reduced the cost of information dissemination and improved content publishing efficiency, it has also necessitated increased investments in technology R&D, platform maintenance, and data security [6]. The constant emergence of new mobile media platforms and

the intense competition for user attention and time between traditional and emerging media have compelled media institutions to continually innovate and refine their business strategies to maintain a competitive edge.

2.2 Sporting Events Broadcasting

The application of mobile transmission technology in sports event reporting has become increasingly important. Mobile transmission technology enables journalists and viewers to obtain real-time updates on the latest information of the competition.

Through mobile phones and other devices, viewers can watch matches in real-time from anywhere, obtaining scores, statistics, and comments. Journalists can use mobile devices to live stream and report on sports events without relying on traditional television broadcasting vehicles, making sports event reporting more flexible and real-time [7]. The audience is allowed to interact with sports events through social media and applications, such as participating in voting, making comments and sharing content [8]. These have enhanced the audience's sense of participation and experience, making sports events spread through a variety of platforms, including television, the Internet, social media and mobile applications [9]. In this way, the competition content can cover more audience groups.

Mobile devices and sensors can collect a large amount of game data, which can be transmitted and analyzed in real-time, providing viewers with more in-depth game analysis and interpretation. With the development of mobile transmission technology, high-definition and even 4K live streaming has become possible, providing viewers with a higher quality viewing experience [10]. Mobile transmission technology can also be used in emergency situations, such as when unexpected events occur at a competition venue, journalists can quickly report on the scene and provide the latest information [11].

High quality sports reporting can enhance the media's brand image and visibility [12]. By reporting on major sports events both domestically and internationally, and conducting exclusive interviews with athletes, media can showcase their professionalism and authority, attracting more attention and trust from users [13]. In addition, the widespread dissemination and high attention of sports coverage have made it a favored advertising platform for advertisers. Media can increase advertising revenue and provide financial support for their own operations and development by inserting advertisements in their reports and offering sponsorship opportunities [14]. The broad and highly loyal audience provides ample space for media to expand business cooperation [15]. Media can establish cooperative relationships with sports event organizers, sports equipment brands, etc., to jointly carry out marketing activities, promote products, etc. [16]

2.3 Business Performance

Businesses are established with the primary objectives of generating profits, expanding operations, and seeking return on assets. The company's performance is often evaluated using various indicators, including gross profit margin, operating margin, and return on assets. These indicators serve as the foundation for decision-making processes within the company. Specifically, gross profit margin (GPM), operating margin (OM), and return on assets (ROA) are all financial performance measuring tools.

2.3.1 Gross Profit Margin

Gross Profit Margin (GPM) is a profitability metric that indicates the proportion of gross profit relative to net sales. A higher GPM signifies a greater gross profit value, enabling companies to cover expenses such as administration, depreciation, interest on debt, and taxes [17]. This reflects positively on a company's performance, potentially attracting investors and driving revenue growth. However, there is some divergence in research findings; one study by Pascarina, Surya, and A. found GPM to have a significant positive impact on profit growth [18], while another by Bionda and Mahdar found no such significant relationship [19].

2.3.2 Operating Margin

The operating margin quantifies the profitability of a company's core operations by measuring the profit generated per dollar of sales after accounting for variable costs of production, such as wages and raw materials, but before factoring in interest or taxes [20]. This metric is derived by dividing the company's operating income by its net sales. A higher operating margin indicates that the company is proficient in converting sales into profits and operating efficiently. It serves as a benchmark for assessing the effectiveness of a company's core operations, and is typically compared within similar industries to evaluate competitiveness. The operating margin is calculated by dividing operating income by sales.

2.3.3 Return on Assets

Return on Assets (ROA) is a financial ratio used to assess a company's profitability over a specified period, as outlined by Amelia and Sunarsi [21]. It gauges the company's effectiveness in utilizing its assets to generate net income, reflecting its profitability potential. A higher ROA indicates a stronger ability to generate profits, which is crucial for evaluating a company's success. The focus on operational profitability through ROA helps to assess company performance. Rachmawati notes that ROA measures a company's profit-making capacity by considering the total assets owned, adjusted for costs associated with funding these assets, such as development and employee management expenses aimed at enhancing intellectual property [22]. Additionally, ROA is defined as the ratio of net income after tax (NIAT) to total assets, with total assets calculated as the average of beginning and end-of-year totals, as highlighted by Asmi [23].

2.3.4 Market Growth Rate

The Market Growth Rate is a metric that quantifies the pace of expansion within the market segment where a company operates, offering valuable insights into the potential opportunities available to the company [24]. It is defined as the increase in sales or market size among a defined customer base over a specified time frame. Analyzing the market growth rate is crucial for businesses to assess their performance. Comparing a company's sales growth with the market growth rate can indicate its overall performance; if the sales growth is equal to or exceeds the market growth rate, it suggests that the business is thriving and in a growth phase. Conversely, when sales growth lags behind the market growth rate, it may indicate that the business is under-performing.

3. METHODOLOGY

This study is a quantitative descriptive correlational design. To collect data for the level of the utilization of MTT devices for sporting events broadcasting of Pioneer Media Company (RQ1), and the level of business performance for sporting

events broadcasting of Pioneer Media Company (RQ2), the researcher distributed questionnaires to the staff of Pioneer Media Company in Beijing, China. The first part of the questionnaire about the utilization of the MTT devices is answered by those directly using the devices while the second part of the questionnaire about the financial is answered by employees in the administrative position. All of the respondents are full-time employees with more than 3 years of working experience in Pioneer Media Company.

For the first part of the questionnaire about the utilization of the MTT devices (RQ1), the sample size calculation followed SLOVIN's formula, ensuring a 95% confidence level and a 0.05 margin of error, resulting in a minimum of 279 respondents, considering the reported staff populations of 925. For the second part of the questionnaire about the financial performance (RQ2), the sample size calculation followed SLOVIN's formula, ensuring a 95% confidence level and a 0.05 margin of error, resulting in a minimum of 80 respondents, considering the reported staff population of 100.

Data are collected from respondents using a questionnaire survey. The questionnaire include the information related to the utilization of MTT devices for sporting events broadcasting of Pioneer Media Company (RQ1), and the level of business performance for sporting events broadcasting of Pioneer Media Company (RQ2).

To ensure the validity and reliability of this research, this study has passed the validity and reliability test. For the validity, the questionnaire was validated through a rigorous process involving the CEO, CTO, and CFO of Pioneer Media Company This expert panel, consisting of key executives with deep knowledge and experience in the media industry, assessed the relevance and appropriateness of each item in the questionnaire. This step aligns with the principle of content validity, where experts in the field evaluate the questionnaire's content to confirm its alignment with the research objective.

To further enhance validity and specifically apply the Lawshe CVI formula, the study engaged a larger group of experts to rate the relevance of each item in the questionnaire on a scale. The Lawshe CVI is calculated for each item by dividing the number of experts who rated the item as relevant by the total number of experts. Items with a high CVI are retained, while those with a low CVI are revised or removed.

For the reliability, the study took additional measures to ensure the consistency and stability of the questionnaire's measurements. Specifically, the questionnaire was pre-tested with 20 individuals who were not part of the final sample. This pre-test allowed for the identification and correction of any ambiguous, confusing, or problematic questions. Based on the feedback from these individuals, adjustments were made to refine the questionnaire, ensuring that it was clear, concise, and easy to understand for the final respondents. This step helped to minimize measurement error and increase the reliability of the data collected.

All potential respondents received individual invitations to complete electronic questionnaires using Questionnaire Star, a widely used data-gathering tool in China. The questionnaire administration was scheduled online from August 15, 2024 to August 18, 2024 by the researcher who distributed Questionnaire Star posters with QR codes in WeChat groups of Pioneer Media Company to invite them to complete the questionnaires. The respondents were given adequate time to complete the questionnaire and were encouraged to provide honest and accurate responses. The collected data was then

analyzed using appropriate statistical methods to draw meaningful conclusions and inform the research findings.

For the utilization of MTT devices for sporting events broadcasting of Pioneer Media Company (RQ1), a 4-point Likert scale was used to collect data, and a general weighted average was used to identify the utilization of MTT devices for sporting events broadcasting of Pioneer Media Company, ranging from 1 to 4 (1=Strongly Agree, 2=Agree, 3=Disagree, 4=Strongly Disagree). For the level of business performance for sporting events broadcasting of Pioneer Media Company (RQ2), a 4-point Likert scale was used to collect data. A general weighted average was used to identify students' attitudes toward copyright infringement arising from live-streaming online education, ranging from 1 to 4 (1=Strongly Agree, 2=Agree, 3=Disagree, 4=Strongly Disagree). For the relationship of the utilization of MTT devices and the business performance for sporting events broadcasting of Pioneer Media Company (RQ3), Pearson correlation coefficient was used.

4. FINDINGS AND DISCUSSIONS

In this section, the researchers present, analyze, and interpret the data gathered in response to the research questions posed for this study. The study investigates Pioneer Media Company's utilization of MTT devices for sporting events broadcasting, focusing on hardware facilities, software facilities, and after-sale services (RQ1). Additionally, it examines the business performance metrics of the company in terms of gross profit margin, operating margin, and return on assets related to sporting events broadcasting (RQ2). Finally, the study explores the relationship between the utilization of MTT devices and the business performance of Pioneer Media Company in the context of sporting events broadcasting (RQ3).

4.1 The Level of the Utilization of MTT Devices for Sporting Events Broadcasting of Pioneer Media Company

The following Table 1 displays the evaluation results of a certain organization or project in terms of hardware facilities, software facilities, after-sales service, and the overall situation. Each variable has a corresponding General Weighted Average (GWA) score and a qualitative value description based on these scores. The GWA score for hardware facilities is 2.82, indicating that these facilities are well-utilized and maintained, although there is still room for improvement, such as updating equipment, maintaining it, or finding more efficient ways of utilization.

Table 1. Level of the Utilization of MTT Devices for Sporting Events Broadcasting of Pioneer Media Company

Utilization of MTT Devices	GWA	Qualitative value
Hardware Facilities	2.82	Mostly utilized
Software Facilities	2.48	Partially utilized
After-Sales Service	2.50	Mostly utilized
Overall Weighted Mean	2.60	Mostly utilized

The overall GWA score is 2.60, reflecting that the entire organization or project is at a moderate level in terms of hardware facilities, software facilities, and after-sales service,

demonstrating certain achievements but still having room for improvement.

The GWA score for hardware facilities is 2.82, indicating that these facilities are well-utilized and maintained, although there is still room for improvement, such as updating equipment, maintaining it, or finding more efficient ways of utilization. The results reflect a certain lag in Pioneer Media's adaptation to new technologies. Modern mobile communication technology, also known as 5G, began commercial use in the early 2020s and has made revolutionary progress, according to Gao [25]. It also reflects the skill level and knowledge of employees in operating and maintaining MTT equipment. The company needs to enhance employee training and technical support to ensure that employees can fully utilize the advanced features of these devices.

The GWA score for software facilities is relatively low, at just 2.48, suggesting that these facilities are not fully utilized. Possible reasons include outdated software, unfamiliarity with operation among users, or a mismatch between the software and current business needs. Therefore, the company needs to find a reasonable balance between business needs and cost-effectiveness to ensure that it can meet business requirements without compromising investments in other areas due to excessive costs, which aligns with the research by Liu and Ju [26].

The GWA score for after-sales service is 2.50, indicating moderate utilization. This means that customers or users have a certain level of satisfaction with the after-sales service, but there may also be unmet needs or room for improvement. Previous research has confirmed the direct impact of regular and effective equipment maintenance on improving equipment reliability, reducing failure rates, and extending equipment life. Cao and Hou stated that with the development of technology and the improvement of remote service capabilities, enterprises prefer to solve technical problems with low real-time requirements through remote support to reduce costs and time consumption. These studies all illustrate the reasons for the lowest mean value of On-site Support.

In summary, the organization or project performs relatively well in hardware facilities and after-sales service but has significant deficiencies in software facilities. The relationship between hardware facilities, software facilities, and MTT is symbiotic. While robust hardware provides the foundation for efficient operations, it is the software that dictates the functionality, user experience, and, importantly, the ease of maintenance. By enhancing software facilities, the organization can not only improve system performance but also facilitate easier and faster repairs, thereby reducing MTT. After-sales service, too, plays a pivotal role in this ecosystem. Prompt and efficient after-sales support can significantly reduce MTT by ensuring that issues are resolved swiftly and effectively. This, in turn, enhances customer satisfaction and loyalty, which are crucial for the long-term success of the organization. To enhance overall performance, the organization should prioritize improvements and optimizations in software facilities while considering moderate upgrades to hardware facilities and after-sales service. Additionally, by collecting user feedback and pursuing continuous improvement, the organization can further elevate its overall performance and satisfaction levels.

4.2 The Level of Business Performance for Sporting Events Broadcasting of Pioneer Media Company

The following discussion addresses the level of business performance for sporting events broadcasting at Pioneer Media Company across four dimensions: Operating Margin, Gross Profit Margin, and Return on Assets, while also delving into the underlying reasons behind these various circumstances.

Table 2: Level of Business Performance for Sporting Events Broadcasting of Pioneer Media Company

Financial Business Performance	GWA	Qualitative value
Operating Margin	2.78	High performance
Gross Profit Margin	2.76	High performance
Return on Assets	2.70	High performance
Overall Weighted Mean	2.75	High performance

With a GWA value of 2.75, Business Performance is categorized as high performance, indicating that Pioneer Media Company has achieved a high level of overall operational performance in its sports broadcasting business. This high GWA value reflects the company's excellent performance in financial, and operational aspects, showcasing its capability to operate stably and maintain a leading position in the fiercely competitive market. The high performance also signifies the company's significant advantages in profitability, financial stability, and resource utilization, laying a solid foundation for future business expansion and investments. According to the Resource-Based View, a company's unique resources and capabilities are the source of its competitive advantage. The high performance of Pioneer Media Company may stem from its possession of unique resources such as a high-quality content production team, an extensive media channel network, a strong brand influence, and solid cooperative relationships with sports event copyright holders. These resources are difficult for competitors to replicate easily, thereby helping the company maintain its leading position in the market.

The highest GWA value is Operating Margin, which is 2.78 and classified as high-performance. The high mean of Operating Margin indicates that the company has done well in controlling costs and improving operational efficiency. This performance is typically attributed to the company's effective measures in cost control and operational efficiency. The company may have successfully maintained a high profit margin by optimizing operational processes, reducing production costs, and improving operational efficiency. Additionally, the company's pricing strategy and market positioning may also have positively impacted the Operating Margin.

The GWA value of Gross Profit Margin is 2.76, categorized as high-performance. The high mean of Gross Profit Margin indicates that the company has excelled in cost management and pricing strategies. This high Gross Profit Margin reflects the company's strong profitability and market competitiveness in its production and sales processes. The reasons for the high Gross Profit Margin typically include the company's implementation of cost control measures during production,

such as optimizing supply chain management and improving production efficiency.

The GWA value of Return on Assets is 2.70. It indicates that the company has excelled in effectively using its assets to generate profits. The company is able to fully leverage the effectiveness of its resources, thereby enhancing overall investment returns. The high ROA is typically attributed to the company's efficient practices in asset management. The company may have achieved a high level of return by optimizing asset allocation, improving asset utilization efficiency, and making rational investments. Additionally, the company's asset management strategies and investment decisions have also played a significant role in enhancing ROA.

In summary, Table 10 shows that Pioneer Media Company has performed outstandingly in the sports event broadcasting business, with all key performance indicators reaching a high-performance standard. This not only indicates that the company has done a great job in market expansion, cost control, profitability, and asset utilization, but also predicts a good development prospect for the company in this business area in the future.

4.3 The Relationship of the Utilization of MTT Devices and the Business Performance for Sporting Events Broadcasting of Pioneer Media Company

In this part, the researcher uses the Pearson correlation coefficient method to calculate the relationship between the utilization of MTT devices and the business performance of Pioneer Media Company in sporting events broadcasting.

Table 3: The Pearson Correlation Coefficient of the Utilization of MTT devices and the Business Performance for Sporting Events Broadcasting of Pioneer Media Company

	Return on Assets	Operating Margin	Gross Profit Margin
Hardware Facilities	0.68	0.64	0.67
Software Facilities	0.61	0.57	0.52
After-Sales Service	0.52	0.53	0.50

The Pearson correlation coefficients reveal a significant positive relationship between the utilization of MTT devices and business performance in Pioneer Media Company's sports event broadcasting operations. These data indicate a central trend: the more effectively Pioneer Media Company utilizes its technological facilities, the stronger its overall financial performance, particularly in improving profit margins and resource utilization efficiency. The Pearson correlation coefficients suggest that hardware, software, and after-sales service all have a positive impact on the company's business performance.

From the perspective of the TOE (Technology-Organization-Environment) framework, these relationships can be explained through an analysis of the company's technological, organizational, and environmental dimensions. In the technology dimension, Pioneer Media Company has invested in and effectively utilized advanced hardware and software facilities, ensuring high-quality and efficient broadcasting.

This technological advantage directly translates into increased gross profit margins and operating margins, as the company can offer high-value services at lower operational costs. The organizational dimension also plays a crucial role. The company's resource management capabilities and organizational culture support the efficient utilization of technological facilities. In the environmental dimension, market demand and competitive pressure drive Pioneer Media Company to continuously optimize its technological facilities. By improving the utilization of these facilities, the company maintains its competitiveness and market position. This adaptability not only contributes to the company's strong market growth rate but also reinforces its financial stability through effective resource utilization and enhanced customer satisfaction.

The Pearson correlation coefficients indicate that Pioneer Media Company's utilization of MTT devices significantly influences its financial performance. The significant positive relationships across all variables suggest that technological utilization, particularly software and hardware, is critical to enhancing profitability, asset efficiency, and market competitiveness. As the company continues to invest in and optimize its technological facilities, it can expect further improvements in business performance.

5. Conclusions and Recommendations

The overall utilization level of Pioneer Media Company is "moderately utilized." This indicates that the company has room for improvement in all aspects, particularly in the utilization of software facilities, where there is significant potential for enhancement. It is recommended that the company increase investment and training efforts in software facilities, optimize software usage processes, enhance employees' software operation skills, and consider introducing more efficient software tools to improve overall operational efficiency and broadcast quality. At the same time, attention should also be given to hardware facilities and after-sales service, with timely optimization and upgrades as needed.

Pioneer Media Company has excelled in various performance indicators for its sports event broadcasting business, with the overall weighted average performance level also being "high-performance." This indicates that the company possesses strong market competitiveness and profitability in the field of sports event broadcasting. It is recommended that the company continue to consolidate and expand its market share in this field. At the same time, the company can consider further innovating and optimizing its business model to maintain its high-performance status and explore new growth points to enhance its long-term competitiveness.

In the sports event broadcasting business of Pioneer Media Company, there is a positive correlation between utilization levels and various business performance indicators, with relatively high correlation coefficients. This indicates that as the company increases its utilization of these facilities and services, its business performance also improves correspondingly. It is recommended that the company further optimize and enhance the utilization of these facilities and services to drive continuous growth in business performance. Specifically, the company can increase investment in updating hardware facilities, improve the efficiency of software facility usage and employee skills, and optimize after-sales service processes to enhance customer satisfaction and loyalty, thereby comprehensively enhancing the company's market competitiveness and profitability.

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