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Impact of the Internet on entertainment media industries: The double effects of Metcalfe and McLuhan

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Abstract. Digital technology and the Internet have revolutionized the entertainment media industry by harnessing network effects and transforming content creation and distribution. However, these advances have also brought challenges, especially regarding intellectual property, with significant long-term implications for entertainment media companies. While the existing literature on this topic is limited, this study aims to analyze the impact of these trends using the Metcalfe and McLuhan effects and provide insights to help traditional media companies thrive in this changing environment. The Metcalfe effect, exemplifying network effects, suggests that the increasing number of Internet users generates economies of scale, amplifies content value, and facilitates the emergence of distribution channels and revenue opportunities in the entertainment media industry. Additionally, the McLuhan effect emphasizes the transformative role of information media in reshaping content production and dissemination. However, the rapid development of the Internet has inadvertently facilitated the piracy of entertainment media content, necessitating the attention and implementation of effective countermeasures by industry stakeholders.

Keywords: McLuhan effect, Metcalfe effect, entertainment media industries, internet

1. Introduction

According to a report by Robin Murdoch (2020), U.S. consumers spent an average of 11.9% more time on digital media in 2020 compared to 2019, indicating a significant increase in Internet usage for entertainment purposes due to the pandemic [1]. Another report predicts that global spending on entertainment and media will reach $2.6 trillion by 2023, with digital spending accounting for most of the growth driven by the 5G Internet [2]. Additionally, a 2017 survey conducted in the US found that 55% of Americans watched TV shows and movies online, compared to only 10% in 2009 [3]. This shift in viewing habits has disrupted traditional television and film distribution channels and significantly impacted the entertainment industry.

The proliferation of digital technologies and the Internet has brought significant changes to the entertainment media industry [4], which is now driven by technology [5]. In the past, people used to go to movie theaters and theaters to watch popular movies, but with the introduction of VCRs and DVD players, programs and documentaries became available for viewing without time or location

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constraints [6]. Nowadays, premium services like Amazon Prime Video and Netflix have made streaming shows and movies incredibly popular [7]. According to Morgan Stanley Research, approximately 1 billion households worldwide will have access to online entertainment through streaming platforms [8].

Two concepts that have played an important role in shaping this industry are the Metcalfe effect and the McLuhan effect [9–11]. The Metcalfe effect refers to the fact that the value of a network increases with the number of users connected to it [12], while McLuhan's effect emphasizes the influence of media on society, arguing that the media itself is the main driver of social and cultural change [13]. Both the Metcalfe effect and the McLuhan effect have several impacts on firms in the entertainment media industry. They have enabled new forms of content creation and distribution [14], changed market structures, and facilitated more effective advertising strategies. However, they have also led to shifts in pricing models and challenges in maintaining control over intellectual property. While some scholars have integrated the Metcalfe effect and the McLuhan effect in the entertainment media industry, further research is needed to fully understand the impact of this convergence on the industry.

The author's viewpoint is that the cultural entertainment produced by the entertainment industry is popular among the general public, despite language and cultural barriers. Thus, it is essential for the industry to effectively communicate with a global audience. In the digital age, the Internet provides a more agile communication channel for the entertainment industry. The McLuhan effect can be seen in the interaction between people and the media on the Internet. Additionally, the Metcalfe effect further explains the network communication on the Internet, providing insights into the impact of the Internet on the entertainment industry. While several studies have examined the short-term effects of the Metcalfe effect and the McLuhan effect on the entertainment media industry, such as the growth of digital platforms [15,16] and the disruption of traditional business models [17,18], there has been limited research on the long-term impact of these concepts on the industry. Therefore, this study aims to analyze the positive and negative impacts of the Metcalfe effect and the McLuhan effect on entertainment media industry companies in the long term. This analysis will provide valuable insights into how traditional media companies can effectively adapt to the digital age, and increase their chances of success by exploiting network effects to new and adapted media. By conducting this study, the author hopes to help companies increase their chances of success in the changing entertainment media industry.

2. The McLuhan effect

McLuhan's education instilled in him a deep appreciation for the transformative power of the telegraph age on human perception and civilization [19,20]. McLuhan argued that prior to the telegraph, information could only travel as fast as the messenger carrying it. However, with the advent of the telegraph, information could be transmitted at unprecedented speeds through the use of electricity [21]. McLuhan also contended that media do more than simply transmit information; they also serve as translators and transformers of communication, shaping not only the message but also the identities of both the sender and the receiver [22].

In 1964, McLuhan's book "Understanding Media: The Extensions of Man" became a classic, arousing widespread interest and enthusiastic response from western academic circles [23]. The core of McLuhan's argument is that "the medium is the message." This statement has two key implications [24]. First, it shows that the message conveyed by the form of the media is as important as its content. McLuhan believed that people must examine the forms of media and their relationship to people. Specifically, the media is an extension of how people shape relationships and behaviors [25]. Second, McLuhan claims that media

content is just another form of media. McLuhan sees media not as isolated entities but as part of a continuous flow of technological forms that affect society and humanity. Thus, the content of one medium becomes the material of the next, just as writing became the content of printing, and printing became the content of the telegraph [26]. McLuhan criticized previous media studies for ignoring these fundamental questions about the nature of media and its impact on society. McLuhan posits that to comprehend media, it is imperative to direct attention toward the technological forms that shape the world [27].

To gain an in-depth understanding of the film, music, broadcasting, publishing, or online game industries, one must have a basic understanding of the media effects that have regulated the development of various media industries [28,29].

Marshall McLuhan once pointed out a media phenomenon: "Any kind of media content will be transformed into other media forms." The media relies on interconnectedness [30] . In other words, any type of media, such as books, music, films, online games, or performances, has content that will be transformed, derived, and communicated with each other. For example, films may be based on novels, novels may be inspired by films or music, and the animation "Marvel's Avengers" has been adapted into online games, while the online game "Assassin's Creed" has been made into a movie [31]. The well-known film "The Phantom of the Opera" was originally adapted from a Broadway performance and even won a film award [32].

McLuhan proposed four media effects through empirical observations, which only reflect a portion of the characteristics. In fact, the four effects can be expanded into seven effects that can fully explain the characteristics of all media industries [29,31,32].

First, extension: Any technology can be used as an extension or expansion of the human body sensory system. For example, the wheels of a bicycle or car are like feet, telescopes and microscopes are like eyes, and telephones and communication devices are like ears and spoken word.

Second, closure: Refers to the balance of sensory stimulus. In other words, when certain perceptions are strengthened, other perceptions will fade or disappear. For example, it is difficult to read and listen to music at the same time. Reading and hearing cannot be at their best simultaneously. On the other hand, when we watch movies or television, the visual colors and images can distract attention from the dialogue or sound in the film. Thus, new media can make old media obsolete and fade away from our attention.

Third, reversal: Means that the value of each other will be reversed when different media develop to the end. For example, the Internet was initially only a part of computer applications. However, with the rapid development of the Internet, it was reversed, and computers were only a part of the network functions.

Forth, retrieval: Each media can be traced back to the previous or old media. For example, books are transformed into movies, which then transform into performances, music, online games, etc., and vice versa. Based on this effect, McLuhan revealed the fifth effect. In fact, the fifth effect was originally considered a part of the retrieval, but most people now think it should be listed separately.

Fifth, entropy or fragmentation: After each medium is successfully developed, it will immediately split into other subsidiary mediums, including series or sequels. For example, other sub-genres of magazines, sub-genres of cable channels, books, TV shows, online games, popular music, or movies are launched, etc. The phenomenon of entropy or fragmentation is available in various media and develops new forms at any time. This process is similar to biological cell division. The division activity continues until the energy is exhausted, and economically, until the risk approaches an unaffordable level. In addition, the concept of thermodynamic entropy can also be used to describe this phenomenon. Media entropy, much like physical and communication theories, arises from a process of continual fragmentation, whereby an initial state of order gradually leads to disorder and chaos. Fragmentation can also be used to identify successful media and entertainment products and services, sorted by power law, as in the analysis of earthquake

intensity, city size, or stock price changes. The scope of application includes films, publication, TV series, music, online games, cable and broadcasting viewers, website visits, and actor compensation and so on. Specifically, this means that fewer than 20% of the products or services in a given industry generate more than 80% of the revenue. Then, the sixth and seventh effects of the media can be further deduced through the power law.

Sixth, exponentiality: This means the exponential growth of revenues, that is, a small number of products or services create major revenues. The 80:20 rule generally applies to most media industries, whereby 20% of products or services generate 80% of revenues. However, some sub-sectors may be even more imbalanced, such as the music industry where nearly 98% of revenue is generated by only 2% of products or services.

Seventh, spread: The nature of media is essentially the message [33]. The success of media feeds users and provides information needs through dynamic information flow [34]. Like water flowing down to the ground, media content will continue to spread greatly; in other words, media content usually seeks the largest online distribution, and similarly, online media also seeks the most information content [28,31,35,36].

3. The Metcalfe's effect

As noted above, most media industries based on entertainment needs follow the law of "Content is King", implying that anyone has the latest and hottest films, publication, music, TV shows or online games, anyone can dominate the market. "Content" is definitely the focus of most concern of consumers and investors. However, to generate the greatest economic value and social and cultural influence, content needs the support of a dense media network and information technology. Thus, the dissemination ability of the Internet is the key to the success of content [37]. In details, even the best content is ineffective if it cannot reach a large audience. As mentioned earlier on spread effect, media content usually seeks the largest online distribution, and similarly, online media also seeks the most information content [38]. The higher the social networking network formed by users, the higher the distribution of naturally generated content, thereby increasing the breadth of content dissemination [39]. Based on such an ecological environment, the Internet has naturally become the basic element of most media industries based on entertainment needs [37,38,40–42].

Nevertheless, the McLuhan effect reveals many media network phenomena, however, many important characteristics still require Metcalfe's effect to further clarify [43]. Metcalfe's effect is named after Robert Metcalfe, who invented Ethernet, one of the most widely used protocols for local area networks today. While working at 3Com Company, Metcalfe developed a simple diagram to illustrate the relationship between network value and cost. His diagram showed that the cost of network cards increases linearly with time (N), but the value of the network formed by those cards increases exponentially (N^2) [44]. Metcalfe's concept has gained popularity in the American science and technology community, and Forbes magazine summarized his ideas about exponential growth of network value in 1993 [45].

Metcalfe's effect, also known as the network effect, applies to various types of networks, including computers, telephones, mass transit systems, and even communication channels used to share opinions with family and friends, such as films, music, TV shows, publications, or online games [46–49]. The network effect is a key aspect of the Metcalfe effect and refers to the phenomenon where the value of a product or service increases as more users adopt it. This effect is fundamental to understanding all types of

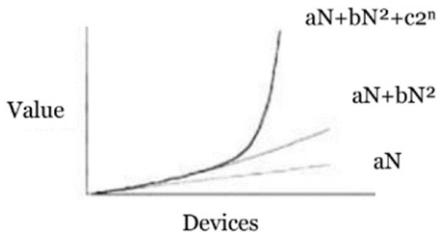

Fig. 1. The Metcalfe's effect.

Internet-based business models. Network effects have been found to contribute significantly to the value of digitally-oriented firms, comprising about 70% of their overall worth [50].

In essence, if a network connection system can maintain efficient transmission, its value is: $V = aN^2+bN+c$. Where V is the value, N is the number of devices or users, and other algebras are constant coefficients. Figure 1 represents this conceptual diagram. In detail, because a network node is different from most traditional point-to-point telephone connection systems, it can be connected to more than one node at the same time, so its value can be greatly increased by the square of N. In other words, the value of the Internet system is exponential rather than linear, and it is constantly expanding rather than decreasing or normal [31,47,48].

In general, McLuhan media effect and Metcalfe's effect reveal the main characteristics of the Internet and media, whether they are new or traditional media. However, as Vogel emphasized that more and more economic phenomena can be compared with biological phenomena [11]. These characteristics of biological phenomena refer to the leaping exponential growth that occurs after long-term gestation. The linear service industry model, constructed relying on traditional economic theory in the past, no longer meets the needs of the Internet economy era [51]. In the network economic model, the knowledge economy has been replaced by other material conditions [52]. The successful development of an enterprise depends on the degree of preparation of its network system. A higher overall value implies a higher preparation of its network system [53,54].

Overall, this double effect can be applied to all media industries based on entertainment needs, and even other industries. As Vogel emphasizes, the Internet industry also includes software development, banking, broadcasting, cable and airlines. In any case, the above-mentioned industry has the following important feature, which means that the sunk cost (cost that is not easy to be discovered and easily ignored) of developing the first product or service is usually high. Moreover, the marginal cost increases with the increasing market sales will also significantly reduce the overall average cost [55,56]. This means that competitive equilibrium is not available in this kind of market ecology and instead, a market monopoly is brought about by strong leadership [57–59].

In addition, the Internet is not only the new and major information and entertainment media, but also the key to the integration of many business operations [60,61] (Table 1). The advent of the Internet represented a disruptive innovation for an industry [62]. It has completely changed the business models of many industries, especially the media industries based on the entertainment needs [63,64]. Table 2 shows chronicle of Internet industry development from 1960 to 2020 [65–71].

However, the Internet has led to agency changes in the media industries. This Internet change effects have different opinions, it is an indisputable fact that it has had a major impact on traditional distribution and agency structures.

In detail, the Internet is like a changeable organism. Users can browse the network of any organization at any time without the permission of government units. Individuals can even become unique publishers

Table 1
Business applications of the Internet

Field	Business value	Explanation	Cases
Workplace collaboration	Individual utilities	Based on the commercial value provided by connecting personal identification	WhatsApp, WeChat
Digital marketing	Reputation	Use the interactive methods of reaching and sharing to expand the user base of potential customer groups to achieve the benefit of exposure	Instagram, Facebook, Twitter
Sharing economy	Asymptotic marketplace	The effect depends on the size of the user	Booking, Uber, Airbnb
Cryptocurrency	Protocol	A common procedure and standard for operating	Bitcoin
Electronic commerce	Marketability	Based on the ability of buyers and sellers to conduct money transactions	eBay, Amazon
Search engine	Data	Use user-generated data to correct errors and enhance utility.	Google, Yahoo
Online game	Platform	Based on increasing the value of market transactions	Nintendo, Twitch

Source: Adapted from Fisk (2020).

or broadcasters around the world. Since the development of the Internet, major changes are available in various media industries. In other words, no matter what kind of media industries structure it is embedded in, the Internet basically plays the following roles:

First, redefine and rearrange (not necessarily completely exclude) the functions and roles of agents or wholesalers and dealers.

Second, not only affects advertisements, orders, and revenue, but even changes the nature of customer relationships.

Third, enhances the variety and accessibility of entertainment, and increases the related products and services substantially.

Fourth, provides a brand-new development path for innovative entertainment products and services.

Fifth, challenges the right-based business structure based on the technology and geographical location.

From a long-term perspective, the last item may be the most disruptive. For example, the distribution contract of films theaters is mainly based on geographical location. Traditional broadcasting signals transmission are also restricted by geographical location, the program broadcasting method can be changed to DVD and iPod. Cable and satellite channel programs are more related to the geographical location of the user. However, through the Internet, geographic location is no longer relevant to the device used and the user's location. Internet promotes decentralized information processing [72]. Traditional territorial barriers have been completely broken due to the omnipresence of the Internet [31,46]. In addition to solving the disadvantages of agglomeration of locations, the Internet increases the diversity of disseminated content [73].

On the whole, we can describe Internet companies in the following two main business models:

Table 2
Chronicle of Internet industry development, 1960–2020

1960–1970	
	ARPA (Advanced Research Projects Agency) and packed-switching concepts appear;
	Department of Defense signs contract to build ARPANET.
1970–1980	
	First ARPANET protocol (NCP);
	First ARPANET email;
	Ethernet and Xerox PARC personal computer concepts developed;
	Altair computer appears on cover of Popular Electronics;
	First routers introduced.
1980–1990	
	Apple Computer II and VisiCalc spreadsheet;
	IBM PC introduced;
	First usage of the term “Internet”;
	TCP/IP protocol established;
	Dot-com domain name registration begins;
	NSF Internet backbone formed.
1990–2000	
	ARPANET dismantled;
	AOL takes shape;
	Internet search engines appear;
	Linux O/S developed;
	World Wide Web begins;
	Mosaic browser distributed;
	Real Player introduced;
	Nescape IPO soars to value of $2.2 billion;
	Microsoft ships Explorer 3;
	XML introduced;
	Amazon.com IPO;
	AOL buys Compuserve;
	Microsoft browser challenged by DOJ for anit-trust;
	AT&T buys TCI for $4 billion;
	Disney buys 43% of Infoseek, NBC buys 5% of CNET;
	Google founded;
	AOL buys Netscape for $4 billion;
	@Home buys Excite for $ 7.5 billion;
	Yahoo buys Broadcast com for $ 5.7 billion.
2000–2010	
	AOL buys Time Warner for $168 billion;
	Terra Networks buys Lycos for $10 billion;
	Microsoft ships Windows XP operating system;
	Linux becomes widely accepted O/S;
	Google IPO;
	Google buys Youtube;
	Microsoft Vista operating system introduced;
	The first open source decentralized encrypted electronic currency operated by non-government and netizens;
	Bitcoin is officially introduced

Table 2 (Continued)

2010–2020	The exchange rate of Bitcoin exceeded $1 for the first time; The Internet corporation for assigned names and numbers (ICANN) introduced the first non-English Internet internationalized domain name (domain name); The global Internet usage rate exceeds 50% of the population

Source: Vogel (2020).

First, on broadcasting, the program is usually accompanied by advertisements, and is provided to users for free or part of the premiums.

Second, on cable, program billing method is through subscription, authorization, and other billing models, including a percentage of the transaction price to compensate system service providers and intellectual property owners. This diversification can reduce cyclical risks. Thus, the revenue model that combines service fees and advertising fees is more popular.

Finally, the evaluation method of the Internet industry can also be applied to the media industries. For example, in the early stage of Internet development, various traditional measurement indicators (including cash flow, revenue or sales, and Asset-liability ratio) were not suitable for evaluating the shares and assets of Internet business, partly due to the rapid growth of the Internet and unlimited future business opportunities. Furthermore, the current accounting evaluation methods cannot fully explain the intangible assets of Internet business, and they often invest intensively in advertising, marketing and research and development in the early stages of development (Altman, 2002). Traditional accounting mainly depends on the occurrence of transactions, however, intellectual assets and value cannot be created or destroyed through any transaction. As for other accounting disputes, it also includes: the recognition of revenues, price discounts, and the recognition of various expenses [31,46].

After all, as Internet and media business mature, traditional evaluation indicators will become more relevant. However, when assets are more and more characterized by options, the option evaluation model (such as Black-Scholes) is more suitable for asset evaluation, because it explicitly considers the volatility of returns and the potential for financial leverage in the early stages of business development, this assumption is that new business can generate a higher return on invested capital (ROIC) [31]. Of course, many new businesses are not profitable in their early stages of development. In such cases, analysts usually first compare the market value of similar business with the acquisition price of assets, or compare the ratio of market value to revenue (or the market value ratio to the cash flow). Others include the ratio of market capitalization to advertising or specific users, average subscriber revenue, or average revenue per hour. These evaluation benchmarks will be adopted or abandoned by investors over time, depending on the market demand and investment intention at that time. Regardless, investors will not simply focus on growth rates unless the target business has unique licensed assets and legal protections [31,74].

4. Internet

At the heart of the Internet are digital connections facilitated by broadband technology [75]. However, digital connectivity cannot be described in isolation; it needs to be seen as part of a wider digital ecosystem that accommodates evolving technologies and a range of use cases and environments. The transformative potential of broadband access is evident in how it improves market access for industry supply chains,

exposes more manufacturers to the Internet, and leads to increased exports and sales [76,77]. This increased connectivity can also lead to the creation of new digital products and services that were previously impossible, unlocking new revenue streams and business models. In addition, the use of broadband technology can increase the productivity and efficiency of manufacturing, as tracking the cost of broadband access can simplify operations and reduce production costs [77]. This can benefit businesses by allowing them to operate at lower costs, which can translate into lower prices for consumers, and create new opportunities for businesses to enter new markets by offering lower-priced goods and services.

Furthermore, the open availability of Internet services can foster broader and deeper participation in digital activities, creating more inclusive and equitable societies. People from all walks of life can access the Internet to learn, transact, and communicate [78,79]. The democratization of knowledge and access to information is facilitated by higher Internet speeds, which improve user experience and facilitate more Internet-based activities [80]. The media industry is also being transformed by the Internet, with Internet Service Providers reducing tariffs and increasing media penetration to turn the Internet into a new audio-visual entertainment platform [10]. The development of broadband has made the Internet a platform for film and television entertainment producers to try out new content, obtain instant and continuous feedback through social media and network traffic tracking services, and offer personalized content based on individual preferences.

The Internet has matured and entered the "Internet era", integrating into all aspects of life, including entertainment, education, and business [81,82]. Traditional industries are now involving consumers in the design and manufacturing process, thereby increasing the value-creation process. The Internet is becoming an increasingly important part of daily life and is transforming all aspects of society. Internet companies are using their data advantages to infiltrate the film industry and improve decision-making in film production, marketing, distribution, and other areas [83]. Theater companies are also taking advantage of the multi-screen platform to interact with consumers and collect information on topics of interest.

5. Discussion

This paper presents the first point of view that when discussing the long-term effects of the Internet on the entertainment media industry today, two effects should be considered simultaneously: the Metcalfe effect and the McLuhan effect. The Metcalfe effect states that the more people use the Internet, the more effective the value generated by the network will be. The popularization of computers and mobile phones and the advancement and transformation of Internet services promote users' willingness to engage in single-person or multi-person entertainment projects. As more users use the Internet, there is a two-way information exchange between more audience groups and content providers. In McLuhan's concept of media as the message, media is considered to shape the user's demand experience. In the context of Internet convergence information, the purpose of the entertainment media industry is to disseminate content, and the value of entertainment content is transformed through consumer experience feedback and entertainment environment differences (e.g., VR).

This paper presents the second point of view that under the influence of the Internet on the entertainment media industry, the Metcalfe effect and the McLuhan effect will have a synergy impact. The content value of film and television entertainment is easily transmitted to entertainment audiences due to the broadband transmission efficiency of the Internet. At the same time, the number of entertainment audience consumption and participation and the degree of sharing content in the community increase the visibility of the value of the content, which makes the Metcalfe effect more obvious.

Then, this paper establishes the double-sided impact of the broadband characteristics of the Internet on the entertainment media industry. Although McLuhan reconstructed the production, distribution, and consumption of entertainment content in the form of media, the speed and convenience of the Internet as a medium has led to a double-sided influence of the Metcalfe effect. On the one hand, the Internet eliminates the barriers of space and time, collects and disseminates film and television content to consumers through the Internet, and generates diverse informational content value. On the other hand, as broadband speeds increase, it becomes easier for users to upload and download pirated copies, increasing the possibility of copyright damage to entertainment content.

6. Conclusions

Given the ubiquity of the Internet, the entertainment media industry must understand how the Internet affects the process by which entertainment content is distributed and possibly changed in value. In this study, the author set out to link the long-run effects of the Metcalfe and McLuhan effects on the entertainment media industry. This study argues that both effects have had a major impact on the overall economy, culture and society. In general, the content of the media gets a lot of attention, but the network distribution system also plays a key and important role. Specifically, on the surface, the media industry has benefited from the rapid development of the Internet. In essence, the Internet has both positive value-added and negative destructive effects on industrial structures, profits, and consumer relationships. The positive impact is: the advantage is the rapid transfer of information to new markets while creating new market structures, while the negative impact is that the more popular the Internet is, the more it disrupts traditional business models, including intellectual property rights.

Future studies could use diffusion theory to develop empirical models that support the arguments presented in this study. Specifically, in the entertainment media industry, diffusion theory aims to establish practical guidelines for implementing new technologies in services [84]. Diffusion theory has been studied in the past literature to help explain the spread of technology over time and has been used to study the impact of Internet adoption on the revenue of manufacturers in the entertainment media industry [85,86]. However, the profitability of entertainment properties depends in part on the penetration of the Internet in a given country. When the Internet is unstable, product content may not be adequately delivered to customers. Therefore, further research could examine the impact of product diversity, market barriers, piracy, and cost on the profitability of manufacturers in the entertainment media industry, with bandwidth mediating this relationship. Greater bandwidth for entertainment media industry manufacturers can reduce information asymmetry and enable consumers to receive more information, which may ultimately affect product diversity, market barriers, piracy, cost variables, and profitability of media industry manufacturers.

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