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The Current Situation and Analysis of Commercial Big Data Application in Small and Medium-Sized Enterprises

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ABSTRACT

Big Data technology is of great value in analyzing business development laws and forecasting. Therefore, Big Data technology is widely used in various industries. However, in the business decision-making of small and medium-sized enterprises, the analysis made by Big Data technology is often not taken seriously. This paper selects small and medium-sized e-commerce enterprises in Jinjiang City, Fujian Province, China as the research object. The research methods were questionnaire survey and field interview. Study the reasons why Big Data technology is not used by enterprises as the main reference for business decision-making. According to the results of the investigation and analysis, targeted solutions are proposed to pave the way for small and medium-sized enterprises to conduct business analysis with the help of Big Data technology.

Keywords: *Big Data Application; Small and Medium Enterprises; E-Commerce; Data Analysis; Countermeasure Research*

I. INTRODUCTION

With the rapid development of social economy and information technology, Big Data technology has gradually entered the field of business decision-making. Due to the large amount of multi-dimensional data beyond the analytical data that traditional information technology can provide (George et al., 2014; Ramanathan et al., 2017), people are interested in Big Data, and future research directions include business intelligence. A promising research direction (Fosso Wamba, Ngai, Riggings and Akter, 2017; Mishra et al., 2016; Mortenson et al., 2015; Wieland et al., 2016). Studies have shown that there is a positive correlation between Big Data, operational efficiency and business performance (Côrte-Real et al., 2017; Fosso Wamba, Gunasekaran, Akter, Ren, Dubey, and Childe, 2017). From the perspective of enterprise business process decision-making, Big Data can help improve the quality of decision-making (Janssen et al. 2017).

Facing the opportunities and advantages brought by Big Data, the Chinese government, from the central to local management agencies, has successively issued a number of policies and guidance on the development of Big Data. The key point is that the development of Big Data should be application-oriented, promote the industrialization of products and solutions, promote technological innovation, fully release the transformative role of Big Data in industrial development, accelerate the transformation of traditional industry management, service model and business model innovation, and Reconstruction of the industrial value chain system. In 2018, the work report of the Jinjiang City Regional Government in Fujian Province described that "some traditional industries and enterprises lack core competitiveness, and the high-tech industries and modern service industries contribute less and less to economic support. Big Data should be taken as the representative. new technologies and new opportunities to accelerate the transformation and upgrading of traditional industries."

However, in the local special survey on enterprise Big Data, it was found that many local production-oriented enterprises, especially small-scale enterprises, often use the experience of operators or the intuition of corporate decision makers as the main decision-making basis in e-commerce operations. Maintain a cautious attitude towards the decision-making application of Big Data in the production and operation process of enterprises. They are skeptical about the decision-making reference value of Big Data in business decision-making. The situation that Big Data is not taken seriously in the practical application of enterprises in Jinjiang is completely opposite to the situation that the government management department actively guides it.

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II. RESEARCH METHOD

The United States continues to place increasing emphasis on data, and the focus has shifted from "technology" to "asset". IBM and Gartner respectively believe that Big Data is a new natural resource and information resource, and it is an important resource to support management decision-making. The British statistics department is actively exploring the use of traffic data Big Data analysis to track the British economic trend to assist the government in making accurate economic decisions. In China, under the promotion of governments at all levels, the application research of Big Data is continuously carried out, and the ability of Big Data analysis is the most concerned. A large number of industries based on the development of Big Data will form new economic growth points, realize the conversion of old and new kinetic energy, and promote economic development. Current ongoing and future research directions include several promising research directions including business intelligence (Fosso Wamba, Ngai, Riggings and Akter, 2017; Mishra et al., 2016; Mortenson et al., 2015; Wieland et al.., 2016).

But in a 2013 report by the Danish Business Administration (Erhvervsstyrelsen, 2013), Big Data was considered a difficult concept to understand and use. The report divides the companies surveyed into two categories. The first category is large companies, usually multinational companies, with long-term experience in the application of business intelligence and business data analysis, and specialized departments and personnel to carry out these tasks. The second category is small and medium-sized companies and companies with a relatively short history. They are concerned about business opportunities in Big Data, but have less experience in using Big Data and lack specialized technical personnel to complete the corresponding work. "Small and medium businesses are often intimidated by the cost and complexity of handling large volumes of data. This puts them at a disadvantage compared to larger competitors." (Donnelly and Simmons, 2013). Studies have found a clear link between the application of Big Data and value creation (Janssen et al. 2017). The value created through Big Data does not only come from the data or technology, but also depends on the management of the organization and the attitude of the top leaders (Müller and Jensen, 2017).

Based on previous scholars' research on the application of Big Data technology, it is found that companies pay more attention to the promotion of Big Data to corporate marketing strategies in the application of Big Data, and use Big Data analysis to accurately find potential customer resources from massive customer data. There are few researches and achievements on the actual application and application effect of Big Data in enterprise e-commerce operation. Therefore, this study formulates whether or not Chinese small and medium-sized enterprises use Big Data in their business strategies, the underlying reasons, and how to make use of Big Data in business decision-making, how to make Big Data technology serve business decision-making, Research hypotheses and research methods for other issues.

2.1 Research Hypothesis

The relationship between enterprise performance and Big Data application. The analytical framework of using Big Data technology in enterprise e-commerce operation can be discussed from three viewpoints: value chain theory, transaction cost theory and enterprise resource-based. The value chain theory was first put forward by Harvard professor Michael E. Porter in 1985, and the value-increasing activities inside and outside the enterprise can be divided into basic activities and supporting activities. Among them, the activities of enterprises using Big Data in e-commerce operations are support activities. Due to the characteristics of Big Data technology, enterprises can obtain strategic advantages in decision-making links in e-commerce operations after using Big Data, thereby optimizing and enhancing the value created by e-commerce in certain links of the value chain. Transaction cost theory believes that enterprises need to pay transaction costs in the process of e-commerce operation. After companies use Big Data technology, they can effectively reduce the cost of searching for customers, information costs and marketing strategy decision-making costs in e-commerce operations. The point of view based on enterprise resources believes that Big Data, as a technical resource in the process of e-commerce operation, can become an important resource for enterprises to create value, optimize value systems, and optimize strategic decision-making methods.

To sum up, the hypothesis is put forward: H1: The application of Big Data can optimize the performance of enterprise e-commerce operation. Momentum actively chooses Big Data technology, and is willing to use Big Data technology to assist business decision-making in e-commerce operations.

The relationship between the enterprise's own conditions and the application of Big Data. Due to the lack of research on the actual application and application effect of Big Data in enterprise e-commerce operations, it is temporarily impossible to retrieve more relevant information from statistical data and literature channels. According to the characteristics of "network data is massive, heterogeneous, diverse and complex, these characteristics will bring many challenges to data collection, integration, storage management and corresponding analysis and mining" [8] and other characteristics to judge the operation process of enterprises in e-commerce The use of Big Data technology for data analysis and auxiliary decision-making requires certain technical reserves and talent reserves. If the enterprise itself lacks the corresponding hardware conditions, it will encounter certain difficulties in the process of use, thereby reducing the willingness to use.

To sum up, the hypothesis is put forward: H2: If the enterprise lacks hardware conditions such as Big Data technical reserve and talent reserve, the willingness of the enterprise to use Big Data will decrease significantly.

2.3 Research Problem

On the basis of the assumption, our research questions are:

Q1: The application of Big Data in enterprise e-commerce operation, including: Does the enterprise use Big Data in the process of e-commerce operation? Whether to use Big Data as the main decision-making aid?

Q2: Through the sorting and analysis of the survey data, what is the underlying reason behind the attitude towards Big Data in the e-commerce operation of enterprises?

2.4 Research Method

This study selects small and medium-sized companies in Jinjiang, Fujian Province, China as the research object. Due to the relatively developed economy in this area, there are many small and medium-sized companies in the area. These companies generally use e-commerce in the sales process to improve their marketing capabilities and improve their business performance. But they did not use Big Data in production decision-making and business decision-making.

This research adopts the research methods of questionnaire survey and in-depth interview. Questionnaire survey part: In the form of online survey, select local companies by industry for survey. Questionnaires are issued to the person in charge of the company or the director of e-commerce operations. We distributed a total of 300 questionnaires, and finally recovered 263 questionnaires, of which 211 were valid questionnaires, and the effective recovery rate was 70.3%. The industries of the companies under investigation involve shoes and clothing, toys, ceramic building materials, paper products, hardware machinery, food, chemicals, textiles, rain gear and others. They accounted for 31.28%, 12.32%, 11.37%, 10.90%, 9.00%, 7.58%, and 17.54% of the effectively recovered samples, respectively.

In-depth interview part: The interviewees selected companies with more than 2 years of e-commerce operation experience, and the e-commerce channel contributed more than 20% of the company's total sales in the previous year. After comprehensively considering factors such as industry proportion and company staff size, 8 companies were selected for in-depth interviews, and through direct and face-to-face communication, we learned about the expected results, usage levels, and application results of Big Data technology in the company's e-commerce operation process. and other information, trying to understand the true attitude of enterprises to Big Data. Table 1 shows the company number, business industry, e-commerce business years, and the approximate proportion of e-commerce sales in the company's sales.

Table 1 Information of the surveyed companies

No.	Industry	E-commerce business years (years)	Proportion of e-commerce sales (%)
C1	Sports shoes, sportswear	3	40%
C2	Sports shoes, sportswear	5	50%
C3	toddler toys	7	40%
C4	ceramic building materials	3	20%
C5	Toilet paper-based paper products	4	30%
C6	Mechanical parts made of metal	2	60%
C7	Biscuit-based bakery snacks	4	60%
C8	umbrella, raincoat	3	30%

III. DISCUSSIONS

3.1 Findings from the questionnaire survey

The following analysis uses SPSS data analysis tool. By sorting out the data returned from the questionnaire survey, it is found that the proportion of companies in Jinjiang choosing e-commerce operations is relatively high, reaching 98.6%. Among them, 47.9% have e-commerce operating years of 5 years or more. Since the Big Data used for the company's e-commerce operation analysis should come from the company's e-commerce operation form, operation years and other relevant information, using the e-commerce operation years as a variable, it is found that the e-commerce operation years have a certain correlation with the company's use of the form of e-commerce. From the data analysis in Table 2, it can be seen that the years of e-commerce operation are significantly correlated with whether to adopt online retail and whether to adopt online social retail, which are 0.183 and 0.283, respectively. There is a certain correlation with whether the online wholesale e-commerce form is adopted, which is 0.088, and there is no obvious correlation with whether the company website is built or whether the cross-border e-commerce is carried out. From this analysis, it can be known that the longer the company's e-commerce operating years, the higher the possibility of using online retail, online social retail and online wholesale, and the more e-commerce-related data that can be obtained accordingly, which can be used in Big Data analysis. more data.

Table 2 Correlation test between e-commerce years and e-commerce expressions

		E-commerce operation years	Corporate website	Online Wholesale	Online retail	Cross-border E-commerce	Online social retail
E-commerce operation years	Pearson Correlation	1	-.108	.088	.183**	-.037	.283**
	Sig.(2-tailed)		.121	.205	.008	.594	.000
	N	211	208	208	208	208	208
Corporate website	Pearson Correlation	-.108	1	.072	-.186**	.299**	.042
	Sig.(2-tailed)	.121		.298	.007	.000	.548
	N	208	208	208	208	208	208
Online Wholesale	Pearson Correlation	.088	.072	1	.311**	-.188**	.087
	Sig.(2-tailed)	.205	.298		.000	.007	.212
	N	208	208	208	208	208	208
Online retail	Pearson Correlation	.183**	-.186**	.311**	1	-.360**	.212**
	Sig.(2-tailed)	.008	.007	.000		.000	.002
	N	208	208	208	208	208	208
Cross-border E-commerce	Pearson Correlation	-.037	.299**	-.188**	-.360**	1	.031
	Sig.(2-tailed)	.594	.000	.007	.000		.658
	N	208	208	208	208	208	208
Online social retail	Pearson Correlation	.283**	.042	.087	.212**	.031	1
	Sig.(2-tailed)	.000	.548	.212	.002	.658	
	N	208	208	208	208	208	208

**. Correlation is significant at the .01 level (2-tailed).

Taking the years of e-commerce operation as a variable, the correlation analysis on whether the company uses Big Data to participate in the decision-making of the e-commerce operation process found that there is a significant correlation between the years of e-commerce operation and whether to use Big Data for business decision-making reference, which is 0.362. See Table 3. This item can confirm the H1 hypothesis. After accumulating a certain amount of e-commerce operation experience, the company has enough motivation to actively choose Big Data technology and is willing to use Big Data technology to assist business in e-commerce operations. decision making.

Table 3 Correlation between e-commerce operation years and Big Data analysis

		E-commerce operation years	Business decision	Competitor
E-commerce operation years	Pearson Correlation	1	.362**	-.005
	Sig.(2-tailed)		.000	.957
	N	211	141	141
Business decision	Pearson Correlation	.362**	1	.326**
	Sig.(2-tailed)	.000		.000
	N	141	141	141
Competitor	Pearson Correlation	-.005	.326**	1
	Sig.(2-tailed)	.957	.000	
	N	141	141	141

**. Correlation is significant at the .01 level (2-tailed).

When analyzing the correlation between whether to use Big Data technology and the reasons for not adopting Big Data, it is found that industry is the main reason that affects whether companies use Big Data technology, which is 0.385. Secondly, the factor that affects the choice of Big Data technology by company owners is that false data cannot bring real Big Data application effects, which is 0.153. The correlations between the lack of technical talents and cost and whether to use Big Data technology are 0.077 and 0.102, respectively. See Table 4. This result partly confirms H2: if a company lacks Big Data technology reserves and talent reserves, the company's willingness to use Big Data will decline. At the same time, it is worth noting that the industry has the greatest impact on companies using Big Data to participate in decision-making. In addition, false transaction data in e-commerce under adverse market conditions is also an important reason for companies to choose Big Data technology to participate in e-commerce operations.

Table 4 Main reasons affecting the use of Big Data

		Whether to use Big Data	Industry	Lack of human resources	Don't understand Big Data	Cost	Data authenticity
Whether to use Big Data	Pearson Correlation	1	-.385**	.077	.069	-.102	.153
	Sig.(2-tailed)		.002	.563	.605	.448	.226
	N	208	64	58	58	58	64
Industry	Pearson Correlation	-.385**	1	-.326*	-.314*	.130	-.037
	Sig.(2-tailed)	.002		.010	.014	.318	.765
	N	64	67	61	61	61	67
Lack of human resources	Pearson Correlation	.077	-.326*	1	.964**	.818**	.573**
	Sig.(2-tailed)	.563	.010		.000	.000	.000
	N	58	61	61	61	61	61
Don't understand Big Data	Pearson Correlation	.069	-.314*	.964**	1	.788**	.598**
	Sig.(2-tailed)	.605	.014	.000		.000	.000
	N	58	61	61	61	61	61
Cost	Pearson Correlation	-.102	.130	.818**	.788**	1	.526**
	Sig.(2-tailed)	.448	.318	.000	.000		.000
	N	58	61	61	61	61	61
Data authenticity	Pearson Correlation	.153	-.037	.573**	.598**	.526**	1
	Sig.(2-tailed)	.226	.765	.000	.000	.000	
	N	64	67	61	61	61	67

**. Correlation is significant at the .01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

The above analysis fully reflects the recognition of e-commerce and Big Data technology by companies in Jinjiang. However, if the company lacks Big Data technology reserves and human resources, it will also seriously affect the enthusiasm for choosing Big Data technology. At the same time, industry reasons, costs and the market environment of false data are also important factors affecting the company's choice.

3.2 Findings from interview

Through in-depth interviews with companies, the survey found that there are positive and negative aspects of Big Data application companies in e-commerce operations.

Willing to accept: the company's active presentation of Big Data applications in e-commerce operations.

The research of this topic found that enterprises showed an active exploration attitude in the face of Big Data. The survey found that 83% of enterprises are willing to try Big Data analysis technology in their e-commerce operations. For enterprises, Big Data is not only a new technology, but also an important resource that can bring new benefits to enterprises. Behind the attention to Big Data and the recognition that Big Data can play a promoting role in e-commerce operations, is the demand of business owners (or persons in charge) to effectively improve the efficiency of business operations through technical means. This has prompted enterprises to be subjectively willing to accept the changes brought about by Big Data.

No	Interview record
C2	There are many companies selling shoes in Jinjiang area. Everyone sells shoes online. Who knows more user information, who can sell well. Of course, we are willing to use Big Data.
C3	Toy production needs innovation. Our company has a dedicated design team. During the work of this department, a large amount of information is collected on the Internet to understand the needs of users. We will use tools to look through the internet to see which designs are not safe to sell to children. With the reference of Big Data, the company saves time and cost in business research. This is awesome.
C4	The company's main channels for selling building materials and ceramic products are sellers or construction merchants, and a small number of individual buyers. Few are sold via e-commerce because shipping is too expensive. Some customers find product information from the Internet, so our company also sends some company information and product information online. Companies haven't used Big Data yet, but we're intrigued. If it can help us increase sales, that's the best.
C7	Now many young people buy snacks through the Internet, so we also sell snacks through the Internet. We also do cross-border e-commerce and are welcomed by foreign customers. Big Data can help us find customers, which will help us gain market advantage.
C8	The industry that produces umbrellas is changing rapidly. If we do not understand the changing needs of the market and users, then we will fail. So we really want to use Big Data.

The famous management scientist Peter Drucker believes that the purpose of a company is to create users. Because only when users are willing to pay for a good or a service can economic resources be turned into wealth. If a company wants to improve its core competitiveness and grasp the changes in customer needs, it must organically integrate with suppliers, distributors and customers to jointly transmit market information, form a value chain, and effectively explore and manage customer resources. Min Yu (2018) believes that: "Creating customers" only points out the direction of the company's efforts, and the company exists for only one purpose: to continuously create better customer value. So, how to continuously create the best customer value? From the company interview process, it was found that the company's specific understanding of the application of Big Data technology in e-commerce operations: to establish more and cheaper sales channels through e-commerce, to find customers and sell goods faster. Through Big Data technology, we can understand what customers want and produce what to meet the specific needs of customers, thereby promoting the rapid development of e-commerce marketing.

From the interview, we got the verification of H1 again: the company has enough motivation to actively choose Big Data technology, and is willing to use Big Data technology to assist business decision-making in e-commerce operations. This is also a positive manifestation of the company's active exploration of using Big Data technology to optimize the effectiveness of e-commerce operations. It is worth mentioning that due to the lack of relevant human resources and Big Data technology, companies in Jinjiang often only use ready-made data analysis tools in the process of E-commerce operations, and do not involve data collection and data cleaning. This finding corroborates that of previous research: "Small and medium-sized businesses often find access to large amounts of consumer data prohibitively expensive" (Donnelly and Simmons, 2013). “Small and medium businesses are often intimidated by the cost and complexity of handling large volumes of digital information” (Simon, 2013).

Uncertainty and worry: the negative presentation of the application of Big Data in the e-commerce operation of the company.

In the past, in the process of e-commerce research on companies in Jinjiang, it was found that companies seldom directly used the information presented by Big Data technology as a basis for decision-making in e-commerce operations, and negatively regarded Big Data as a reference value for business decision-making. Therefore, during the investigation, we focused on the specific use of Big Data technology in e-commerce operations and whether it is the main reference for the company's business decision-making. It was found in the interview that the problem of data authenticity is the main reason why companies do not use the information provided by Big Data technology as the basis for direct business decisions.

No	Interview record
C1	The company will refer to the information provided by the Big Data analysis tools provided by the e-commerce platform in its operations, but it will never fully trust the data. Because there will be some false data in the process of doing business with Chinese people. We have no way of telling which data is real and which is fake. So we can only use it (Big Data) as a reference. In our company's business decisions, we rely primarily on the experience of senior leaders.
C5	Our company cooperates with many supermarkets. Products are mainly produced according to customer's order requirements. The work of producing toilet paper is very hard, the working environment is relatively noisy, the salary level is low, and it is difficult to recruit employees who understand Big Data. E-commerce platforms, like 1688.com, are just one channel through which we engage with customers. Big Data has not been used yet.
C6	Yes, we regularly go and look at the data we can find. Because metal mechanical parts must be mass-produced, otherwise the cost is very high. Mass-producing products means a lot of raw material costs and labor costs. Because it is difficult for us to obtain real and effective data, if (the decision made by Big Data) the wrong choice, the loss is unbearable. Our company mainly produces custom-made products. For example: the clothing industry, the industry that makes luggage, the factory that makes umbrellas, the factory that makes small industrial equipment, all custom products from us. These custom-made products require high product quality and relatively high profits. We have been serving these clients for many years. These orders do not require Big Data. (laugh) Our company has no employees familiar with Big Data technology...maybe it is expensive...our company is small and may not need to use Big Data to make business decisions.

C8	It is difficult to recruit the right employees who understand Big Data. And off-the-shelf Big Data tools are too expensive. The biggest problem is that we don't know if the data is real. The cost of trial and error was too high, and our company was too small to afford a failed investment.

The information obtained through the interviews confirms H2: if the company lacks Big Data technical reserves and talent reserves, the company's willingness to use Big Data will decline. At the same time, when a large amount of false data appears in the market environment, the authenticity of the data will be affected, and the reference value of knowledge presented by Big Data will be reduced accordingly. People's social behavior is neither completely determined by the subjective will of the individual, nor entirely determined by the social structure, but the result of the combined effect of the two. The same goes for the business practices of companies. People are relatively more cautious when it comes to making decisions about future behavior in the course of a company's business activities. Even if the government has issued various policies to vigorously advocate the implementation of Big Data in the actual production environment, even if the person in charge of the company subjectively agrees that Big Data will bring positive effects to e-commerce operations, due to the objective lack of technical strength and human resources Problems such as lack of resources and the inability to ensure real market transaction data make them more inclined to past experience and decision makers' intuition when making business decisions.

3.3 Discussion

According to the actual situation found in this paper, in order to promote the practical application of Big Data technology in small and medium-sized companies, put forward practical management suggestions.

First, the application value of Big Data technology in different industries should be fully exploited. Big Data technology can not only provide decision-making reference for companies in the field of business decision-making, thereby bringing about direct benefit improvement, but also play an important reference role in decision-making in financial management and talent reserve regardless of industry.

Secondly, it is recommended to standardize the market environment of e-commerce operations, and to ensure that users can obtain real transaction data by cracking down on false transaction behaviors, and improve the reference value of Big Data.

Third, some companies mentioned in the interviews that they built their own databases, but they have not been able to implement them considering the difficulty, limitations and costs of collecting data. Therefore, it is recommended to take the industry as a unit and take the lead in building an industry database through industry associations, so as to enhance the reference value of Big Data to the operation of companies in various industries, optimize the effectiveness of Big Data in e-commerce operations, help companies improve operating efficiency, and enhance the use of Big Data technology in the operation. Reference value in business decisions. From the perspective of practical application value, guide small and medium-sized enterprises to use Big Data, improve the correctness of decision-making, and improve business performance.

IV. CONCLUSION

This study collected 211 valid questionnaires through a special survey of companies in Jinjiang, and used analysis methods such as data statistics and data correlation to analyze the distribution of e-commerce operating years of companies in Jinjiang, and the relationship between e-commerce operating years and Big Data technology applications. The relationship between them and the main reasons that affect the use of Big Data technology are analyzed. And use the form of in-depth interviews to directly understand the company's attitude towards the application of Big Data technology. The main conclusions are as follows:

Companies are well aware of the positive effects of Big Data technology on electronic operations. There is a correlation between the years of e-commerce operation and the adoption of various e-commerce operation methods. The most obvious ones are online retail and online social retail, which are 0.183 and 0.283, respectively. And the company showed a clear willingness to use Big Data technology in e-commerce operations, and the most obvious one was the use of Big Data technology to assist business decision-making in e-commerce operations, which was 0.362. Second, the most important factor that affects companies adopting Big Data technology to participate in decision-making is the company industry, followed by false transaction data, and the third is the lack of technical talents and cost issues. It shows that in different industries, the willingness of companies to use Big Data varies greatly. After removing industry factors, although the company has shown a willingness to use Big Data to improve the effectiveness of e-commerce operations, it has shown a wait-and-see attitude in specific Big Data applications due to the influence of talents, costs, and adverse market conditions. The practical suggestions put forward in this paper can help managers think about how to optimize the business environment, guide companies to use Big Data to make more favorable business decisions, and improve their advantages in market competition.

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