Enterprise Intelligent Transformation and Earnings Management

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Abstract: The integration of a new generation of intelligent technology and manufacturing is profoundly changing the development model of manufacturing. Based on the sample of all A-share listed companies from 2003 to 2021, this paper examines the impact of intelligent transformation of enterprises on earnings management. The findings indicate a clear correlation between the intelligent transformation of enterprises and a notable decrease in earnings manipulation; The important ways that the intelligent transformation of enterprises affects earnings management are agency cost, media attention, and labor allocation ratio. The development level of the digital economy and the modernization level of the industrial chain play significant regulating roles between them. The influence of intelligent transformation on earnings management has the property of equity and regional heterogeneity. This paper inspires the reduction of risks in the process of intelligent transformation and the improvement of the internal governance system of enterprises. It also provides a new idea for studying the factors influencing earnings management.

Keywords: enterprise intelligent transformation, accrued earnings management, real earnings management.

1. Introduction

The manufacturing industry has ushered in a fundamental change in the production mode and enterprise form with the breakthrough of the new generation of information technology represented by artificial intelligence. Fierce market competition and diversified customer needs have driven China's manufacturing industry to enter the ranks of intelligent transformation. The world is currently experiencing a major unprecedented change, with a new round of industrial revolution now taking shape. Accelerating the "chemical reaction" between intelligent technology and the manufacturing industry is essential to progress from "Made in China" to "Intelligent Manufacturing in China."

The issue of corporate earnings management has always been the focus of academic attention. Due to the asymmetry of information in the market, corporate management tends to carry out improper earnings management to convey favorable information to external investors, which degrades the quality of corporate earnings management information, damages stakeholders' interests, and negatively impacts the stable development of the capital market.

Enterprise intelligent transformation is a long-term process of continuous attempts and exploration, with great technical difficulty and strong uncertainty. When artificial intelligence technology has problems that make it unable to integrate with the original foundation of enterprises effectively, or

when companies misuse AI for purposes like manipulating earnings, the correlation between intelligent transformation and earnings management becomes highly unpredictable. Therefore, how to correctly play the positive role of intelligent transformation in the earnings management of enterprises is urgently discussed in the academic circle.

The research significance of this paper is as follows: At the theoretical level, first, looking at the literature on intelligent transformation of enterprises at this stage, most of them focuses on the impact of intelligent transformation on enterprise innovation, enterprise organizational resilience, and other fields, but there is little exploration in the field of accounting. Hence, delving further into the research on how intelligent transformation affects corporate earnings management not only enhances the scholarly understanding of the inner workings of intellect and corporate earnings management but also offers a tangible quantitative approach to measuring intelligence. Second, starting from the theory of information asymmetry, this paper examines the effects of intelligent transformation on two different earnings management methods, offering novel insights into the study of the impact of intelligent transformation on enterprises. At the practical level, existing studies have confirmed that intelligent transformation will positively impact enterprises, but there are still a few scholars who believe that it will increase the cost burden of enterprises. This paper reveals that intelligent transformation will inhibit the earnings management of enterprises, which will help deepen the academic circle's understanding and cognition of the positive impact of intelligent transformation.

2.   Literature Reviews

Scholars have explored the effects of intelligent enterprise transformation from multiple angles. These encompass its effects on manufacturing innovation, organizational flexibility and growth, total factor productivity, business performance, and restructuring of internal labor dynamics, etc. Liu Wei et al. found through their research that economic policy uncertainty would weaken the promoting effect of intelligent transformation on enterprise innovation, but would increase it for enterprises that pay attention to substantive innovation [1]. Zhang Shushan and Dong Xuda concluded that intelligent transformation can achieve a positive impact on the high-quality development of enterprises by improving organizational resilience [2]. Yue Yujun and Gu Meng found that intelligent transformation of manufacturing enterprises can improve their performance through differentiation strategy and cost leadership strategy [3].

The existing literature explores the various factors that influence earnings management, such as ESG performance, audit fees, financial technology, charitable donations, social insurance contribution levels, etc. Li Kaile et al. found that audit input has a mechanism effect on the inhibition of ESG performance on earnings management activities of enterprises [4]. Dai Lijun and Zhang Jianxiang's empirical test showed that audit fees inhibit the earnings management of enterprises mainly by improving audit quality [5]. He Yong's analysis found that financing constraints would amplify the restraining effect of financial technology on accrual earnings management and weaken the promoting effect on real earnings management [6].

The literature review reveals a wealth of research on the impact of intelligent transformation on enterprises in the fields of enterprise strategic management and economics, and there is also much research on the factors influencing earnings management. However, there are few in-depth studies on the combination of intelligence and accounting and a scarcity of literature on the link between intelligent transformation and earnings management. Therefore, this study focuses on this, analyzes how intelligent transformation has an impact on the earnings management mechanism of enterprises, and establishes a theoretical basis for the intelligent transformation of Chinese enterprises.

3. Mechanism Analysis and Hypothesis Proposal

The concept of intelligent transformation entails utilizing cutting-edge technologies like intelligent technology, network technology, and other advanced information and manufacturing technologies to enhance and modernize the production, operation, and organizational management processes within traditional manufacturing industries [7]. Earnings management can be divided into accrual and real earnings management. The former is that enterprises conceal real performance through the application of accounting standards and accounting policies in the process of processing accounting information. Because enterprises have greater flexibility in the selection process of criteria, and with the continuous emergence of new business forms, there are more and more unstipulated transactions and economic matters, enterprises have greater space to use these loopholes to implement earnings management, but at the same time, enterprises are faced with greater litigation risks. The latter pertains to the actions of businesses altering the timing or structure of their operations, investments, and financing to manipulate accounting profits. The implementation of real earnings management can effectively reduce the inspection risk, but it will also make the management face long-term earnings management pressure. Therefore, the trade-off between the two methods of earnings management is often a difficult problem for managers. However, the intelligent transformation of enterprises has a similar impact mechanism in the two ways, and this paper will combine the two for analysis.

First of all, intelligent transformation helps to improve the ratio of enterprise labor allocation, reduce enterprise production costs, and weaken the motivation of management to carry out earnings management. The development of intelligent technology will reduce the price of machinery and equipment so that the same capital investment can buy more equipment to replace human capital, and intelligent equipment has the advantages of intelligent decision-making, self-learning, and self-adaptation, which helps to shorten the life cycle of jobs, reduce the human demand for machine management, operation, and maintenance, and reduce the scale of enterprise's investment in labor. Lowering production costs for businesses decreases the incentive for management to engage in earnings manipulation due to performance evaluation.

Secondly, intelligent transformation reduces the agency cost of enterprises and compresses the space of management earnings management. Manufacturing enterprises in the stage of intelligent transformation will save and record the data involved in daily business activities in the data center, and form a real-time monitoring mechanism through business data, promoting a high degree of information transparency. Simultaneously, the integration of big data and artificial intelligence provides external information users with a rich way to obtain information and weakens the agency cost caused by information asymmetry. It weakens management's ability to manage earnings to send positive signals to the outside world.

Finally, as the main body of external supervision, the media can play a role in restraining managers. At present, the integration of intelligent technology and the manufacturing industry has become a new opportunity for the innovation and development of the manufacturing industry, which is bound to attract more media attention, resulting in increased difficulties for management to implement earnings management. Based on the preceding analysis, this study presents hypothesis H1:

H1: Intelligent transformation has a significant negative effect on the earnings management of enterprises.

High-performance artificial intelligence algorithm training needs the support of big data, and the main production material of the digital economy is large-scale industrial data. The deep integration of artificial intelligence and digital economy can more effectively use machine learning algorithms to mine the hidden corporate earnings management information in a large amount of data and capture the private information hidden by the management, increasing the likelihood that improper earnings management will be detected; In addition, corporate earnings information is often transmitted to

investors through the interpretation and analysis of financial reports, auditors and other media, and the authenticity of the information is lost in the multi-chain communication, and even faces the risk of being hidden again into inside information [8]. However, the efficient integration of artificial intelligence and digital economy promotes the efficiency of information dissemination, alleviates the problem of information lag, and can effectively restrain the profit manipulation behavior of management. Based on this, this paper proposes hypothesis H2:

H2: The more advanced the digital economy becomes, the more potent the impact of intelligent transformation on curbing earnings management will be.

Upstream and downstream enterprises in the industrial chain can build a relatively open and traceable industrial ecological environment based on real-time collection and intelligent analysis of the whole industrial chain data driven by artificial intelligence, which increases the difficulty of implementing earnings management behaviors and alleviates speculative behaviors [9]. At the same time, intelligent systems play a key role in industrial connectivity, fostering collaboration among businesses in industrial chain modernization, improving the efficiency and competitiveness of the entire value chain, and thus enhancing market position and market influence. To achieve good performance and convey to the market the advantages of company value and product quality compared with competitors, management will proactively enhance information transparency and reduce incentives for manipulating earnings. Based on this, hypothesis H3 is proposed in this paper:

H3: The higher the modernization level of the industrial chain, the stronger the inhibitory effect of intelligent transformation on earnings management.

4. Research Design

4.1. Sample Selection and Data Sources

This study utilizes data from all A-share listed companies spanning from 2003 to 2021, comprising a panel dataset that includes 3,363 listed entities. The primary source of this data is the CSMAR database, and the samples were processed as follows: the data of the financial industry, ST, *ST, PT enterprises, and the industry observation value less than 10 were excluded, and the 1% and 99% quantile tail processing were carried out for continuous variables.

4.2. Variable Selection

Explained variable: accrued earnings management (|DA|). This paper adopts the manipulative accruals estimated by the modified Jones model for each year and industry as the indicator of enterprise accrued earnings management. Since maneuverability should be counted in a signed direction, the absolute value of its result is taken in this paper. In real earnings management (|REM|), following Roychowdhury, this paper uses the sum of three indicators of abnormal operating cash flow, abnormal expenses, and abnormal product cost to measure, and takes the absolute value of the result [10]. To eliminate the dimensional impact, this paper magnifies the accrued earnings management and the real earnings management by 10 times.

Explanatory variable: Enterprise intelligent transformation level (AI). Referring to the practices of Sun Wenyuan and Liu Yushan, this paper uses the per capita value of enterprise machinery and equipment, that is, the machine book value/total number of employees published in the enterprise fixed assets statement, to measure the adoption degree of enterprise AI [11], and takes its standardized value as the core explanatory variable.

Control variables: Based on previous studies, this paper selects corporate asset-liability ratio (Lev), net profit margin on total assets (ROA), cash flow ratio (Cashflow), Growth rate of total assets (Growth), nature of property rights (Soe), and equity concentration (Top10) as control variables. And the fixed effect of Year and Industry is controlled.

4.3. Model Specification

This study has developed a model to examine the influence of enterprise intelligent transformation on earnings management by utilizing theoretical analysis and research hypotheses.

$$| DA_{i,t} |= \beta_0 + \beta_1 AI_{i,t} + \sum \beta_n Control_{i,t} + \lambda_t + \mu_i + \varepsilon_{i,t} \qquad (1)$$

$$| REM_{i,t} |= \beta_0 + \beta_1 AI_{i,t} + \sum \beta_n Control_{i,t} + \lambda_t + \mu_i + \varepsilon_{i,t} \qquad (2)$$

Where, i denotes listed enterprises, t denotes the year, $AI_{i,t}$ is the measurement of intelligent transformation of listed enterprises. Coefficient β_1 is the core scalar coefficient that this paper focuses on to measure the impact of intelligent transformation on earnings management. λ_t, μ_i are fixed effects of year and industry respectively, $\varepsilon_{i,t}$ indicating random error.

5.   Empirical Analysis

5.1. Descriptive Statistics

Table 1 shows that the level of earnings management implemented by different enterprises varies greatly, but in general, the extent of net profit adjustment by real earnings management is greater than that by accrual earnings management. To mitigate discrepancies resulting from variations in dimension, this paper standardizes the enterprise intelligence level, and the statistical results show that the data is smooth without abnormal fluctuations.

Table 1: Descriptive Statistical Analysis

Variable	N	Mean	SD	p50	Min	Max
|DA|	25629	0.574	0.583	0.398	0.000	5.430
|REM|	25629	1.322	1.394	0.924	0.000	28.870
AI	25629	-0.003	0.394	-0.035	-0.054	23.030
Lev	25629	0.455	0.198	0.457	0.027	0.990
ROA	25629	0.036	0.066	0.035	-0.375	0.254
Cashflow	25629	0.050	0.071	0.049	-0.232	0.283
Growth	25629	0.176	0.426	0.111	-0.737	3.808
SOE	25629	0.466	0.499	0.000	0.000	1.000
Top10	25629	0.571	0.147	0.577	0.208	0.916

5.2. Benchmark Regression Analysis

Models (1) and (2) are used to perform regression tests on hypothesis H1. Columns (1) and (2) show that intelligent transformation and accrual earnings management are significantly negative at the 5% level, and the degree of intelligent transformation changes by one unit, resulting in a 2.1% reduction in accrual earnings management. Intelligent transformation and real earnings management are significantly negative at the 1% level, and each unit increase in the degree of intelligent transformation will lead to a 5.7% decrease in real earnings management. To make the results more convincing, the baseline regression test is conducted again after the intelligence level is increased by 1 and the logarithm is taken. The results are shown in columns (3) and (4). Both of the two earnings management methods are significantly negative at the 1% level, indicating that the intelligent transformation of enterprises can inhibit the two earnings management methods.

Table 2: Benchmark Regression Analysis

	(1) |DA|	(2) |REM|	(3) |DA|	(4) |REM|
AI	-0.021**	-0.057***	-0.033***	-0.137***
	(-2.347)	(-2.666)	(-8.475)	(-15.001)
Lev	0.047**	0.482***	0.047**	0.486***
	(2.225)	(9.823)	(2.264)	(9.952)
ROA	-1.571***	3.434***	-1.615***	3.252***
	(-24.767)	(23.105)	(-25.414)	(21.902)
Cashflow	-0.765***	-0.724***	-0.736***	-0.602***
	(-13.973)	(-5.642)	(-13.437)	(-4.702)
Growth	0.190***	0.415***	0.188***	0.408***
	(21.971)	(20.465)	(21.784)	(20.178)
SOE	-0.055***	-0.115***	-0.049***	-0.089***
	(-7.151)	(-6.363)	(-6.339)	(-4.952)
Top10	0.101***	0.473***	0.102***	0.476***
	(4.008)	(7.983)	(4.029)	(8.072)
_cons	0.582***	0.727***	1.012***	2.503***
	(32.655)	(17.418)	(18.872)	(19.983)
Year	YES	YES	YES	YES
Industry	YES	YES	YES	YES
N	25,628	25,628	25,628	25,628
R2	0.107	0.143	0.109	0.151

Note: *p<0.1,**p<0.05,***p<0.01; the numbers in parentheses are t statistics, the same as below.

5.3. Robustness Test

Five methods are used to test robustness in this paper. In column (1) (2), based on the existing model, the control variable ROE (return on equity) is added and the control variable is replaced, that is, the property right nature (SOE) is replaced with Dual; Column (3) excluding the 2020 data, which is greatly affected by the COVID-19 epidemic; Column (4) substitutes the measurement method of core explanatory variables, refers to Li Wanhong and Li Na, and uses the proportion of the total number of intelligent transformation keywords of manufacturing enterprises in the same year to the total number of similar keywords to assess the degree of intelligent transformation of enterprises [12]. Column (5) uses the clustering robust standard error with individuals as clustering variables, and the regression results are all robust.

Table 3: Robustness Test Analysis

	(1) Add control variables		(2) Replace control variables		(3) Remove disturbing factors		(4) Replace core explanatory variables		(5) Using clustering robust standard error	
	|DA|	|REM|	|DA|	|REM|	|DA|	|REM|	|DA|	|REM|	|DA|	|REM|
AI	-0.021**	-0.056***	-0.021**	-0.057***	-0.020**	-0.055**	-0.021***	-0.019**	-0.021***	-0.057**

Table 3: (continued).

CONTROLS	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
_cons	0.554***	0.658***	0.559***	0.670***	0.563***	0.697***	0.617***	0.760***	0.582***	0.727***
	(30.824)	(15.635)	(31.322)	(16.018)	(29.199)	(15.374)	(33.017)	(17.315)	(23.499)	(11.704)
N	25,629	25,629	25,629	25,629	22,599	22,599	25,574	25,574	25,629	25,629
R2	0.111	0.148	0.106	0.143	0.105	0.146	0.108	0.144	0.107	0.144
Year	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

6. Mechanism Test

6.1. Mediation Effect Test

The intelligent transformation process of enterprises often brings about agency costs, media attention, and changes in labor allocation ratio, etc. Therefore, this paper takes the three as mechanism variables to test the inhibition mechanism of intelligent transformation on the earnings management of enterprises. Concerning agency cost, the cost dimension is measured by operating expense ratio (Age1), that is, the ratio of the sum of administrative expenses and selling expenses to operating income; the efficiency dimension is measured by the ratio of total assets turnover (Age2), that is, the ratio of operating income to the average total assets; As for media attention, the data reported by the media is used as the measurement method of media attention (Med), and the natural logarithm is taken after adding 1 to the data. In the aspect of labor allocation ratio, this paper calculates the excess employees (Exc). The following estimation formula is used:

$$Empolyee_{nit} = \beta_0 + \beta_1 Size_{nit-1} + \beta_2 Capital_{nit-1} + \beta_3 Growth_{nit-1} + \lambda_t + \mu_i + \varepsilon_{nit} \quad (3)$$

After the estimated number of normal employees $Employee_{nit}$ is obtained, the excess employees are obtained by subtracting the actual number of normal employees.

The following table shows that the regression coefficient of the impact of enterprise intelligent transformation on excess employees and agency costs is negative, and the regression coefficient of the impact on media attention is positive, both at the level of 1%, indicating that the improvement of intelligence level will restrain the excess employees of enterprises and reduce agency costs, and play a certain role in promoting media attention.

Table 4: Mediation Effect Test Analysis

	(1) Exc	(2) Med	(3) Age1	(4) Age2
AI	-0.172***	0.066***	-0.009***	-0.072***
CONTROLS	YES	YES	YES	YES
_cons	-0.071***	3.531***	0.298***	0.342***
	(-2.938)	(87.005)	(52.439)	(22.009)
N	25,629	25,629	25,629	25,629
R2	0.071	0.372	0.070	0.059
Year	YES	YES	YES	YES
Industry	YES	YES	YES	YES

6.2. Moderating Effect Test

The development level of the digital economy and the modernization level of the industrial chain are selected as the moderating variables in this study. To avoid the influence of multicollinearity, the variables measured by the interaction term are centralized before the concrete test.

In terms of the development level of the digital economy, the Comprehensive Development Index of the Digital Economy (Dig) is obtained from the two aspects of Internet development and digital financial inclusion. Columns (1) (2) in Table 5 show that the interaction coefficient (Interact1) between the comprehensive development index of the digital economy and the degree of intelligent transformation of enterprises is significantly negative, which indicates that with the continuous improvement of the comprehensive development index of the digital economy, the risks faced by enterprises in earnings management will increase. To avoid greater losses, with the improvement of the intelligence level of enterprises, The degree and motivation of management to actively implement earnings management will be weakened.

For the industrial chain modernization level, this paper selects indicators from six dimensions of industrial chain foundation, digital industry chain, innovation industry chain, industrial chain toughness, industrial chain collaboration, and sustainable industry chain, and calculates the industrial chain modernization level comprehensive index (Ind). Columns (3) (4) in Table 5 show that the interaction coefficient (Interact2) between the modernization level of the industrial chain and the degree of intelligent transformation of enterprises is significantly negative, indicating that with the continuous improvement of the modernization level of industrial chain, the possibility of litigation risk and long-term negative impact on enterprises arising from the implementation of earnings management by management will increase. To avoid unnecessary losses, The increase in enterprise intelligence level will weaken the motivation of earnings management.

Table 5: Test Analysis of Moderating Effects

	(1) |DA|	(2) |REM|	(3) |DA|	(4) |REM|
AI	-0.047***	-0.151***	-0.067***	-0.222***
Dig	0.083***	0.162***		
Ind			0.236***	0.299**
Interact1	-0.159***	-0.348***		
Interact2			-0.372***	-1.102***
CONTROLS	YES	YES	YES	YES
_cons	0.551***	0.826***	0.525***	0.815***
	(29.343)	(18.303)	(24.929)	(16.078)
N	25,629	25,629	25,629	25,629
R2	0.080	0.070	0.080	0.070
Year	YES	YES	YES	YES

7. Heterogeneity Analysis

As for the nature of equity ownership, columns (1) and (2) of Table 6 reveal that in state-owned and non-state-owned enterprises, the regression coefficients of intelligent transformation and accrual earnings management are -0.023 and -0.005, respectively, indicating that the impact of intelligent transformation in curbing accrual earnings management is more pronounced in state-owned enterprises. This may be because under the economic background dominated by state-owned

enterprises, power resources of all parties are concentrated and inclined to state-owned enterprises, which receive greater policy backing than privately-owned businesses, are subject to insufficient supervision, and it is easier to implement accrued earnings management. Columns (3) and (4) show that the inhibitory effect of intelligent transformation on real earnings management is stronger in non-state-owned enterprises. Due to the special nature of state-owned enterprises, they tend to bear more social responsibilities than non-state-owned enterprises, and the management of state-owned enterprises is less sensitive to compensation performance, while the cost of real earnings management is higher and it will bring harm to the long-term development of enterprises. Therefore, the motivation of management of state-owned enterprises to implement real earnings management is lower than that of non-state-owned enterprises.

For the region, the inhibitory effect is stronger in the east and weaker in the central and western regions whether from the relationship between enterprise intelligent transformation and accrual earnings management (column 5.6) or real earnings management (column 7.8). Some scholars have found that the earnings management degree of listed companies in China will be affected by the external governance environment. Because the eastern region of China has the best external governance environment, a higher degree of marketization, less government intervention, and strong corporate profitability, the motivation for earnings manipulation is stronger than that of the central and western regions.

Table 6: Heterogeneity Test Analysis

	(1) Non state-owned enterprises	(2) State-owned enterprise	(3) Non state-owned enterprises	(4) State-owned enterprise	(5) Non-eastern region	(6) Eastern Region	(7) Non-eastern region	(8) Eastern Region
AI	-0.005	-0.023**	-0.133**	-0.024	-0.010	-0.034**	-0.023	-0.088**
CONTROLS	YES	YES	YES	YES	YES	YES	YES	YES
_cons	0.514***	0.560***	0.615***	0.765***	0.513***	0.610***	0.780***	0.717***
	(21.195)	(20.938)	(10.185)	(13.319)	(16.441)	(27.986)	(11.569)	(13.598)
N	13,681	11,948	13,681	11,948	8,242	17,387	8,242	17,387
R2	0.130	0.107	0.151	0.155	0.102	0.120	0.178	0.138
Year	YES	YES	YES	YES	YES	YES	YES	YES
Industry	YES	YES	YES	YES	YES	YES	YES	YES
P-value	0.060		0.010		0.040		0.010	

Note: The P-value of the inter-group difference test for the coefficients of the heterogeneity analysis was calculated using the Fischer combination test (100 samples).

8. Research Conclusions and Recommendations

The integration of intelligent technology and manufacturing has become a new opportunity for the innovation and development of manufacturing at present. This paper takes the data of all A-share listed companies from 2003 to 2021 as samples to empirically test the impact of intelligent transformation of enterprises on earnings management. The findings are as follows: First, the intelligent transformation of enterprises has a significant negative effect on earnings management.

Second, the impact mechanism test shows that the intelligent transformation of enterprises weakens the motivation of earnings management by restraining excess employees, reducing agency costs, and increasing media attention. The higher the level of development of the digital economy and the modernization of the industrial chain, the stronger the inhibitory effect of intelligent transformation on earnings management. Thirdly, heterogeneity analysis shows that intelligence level has a stronger inhibitory effect on the accrual earnings management of state-owned enterprises, but has a stronger inhibitory effect on the real earnings management of non-state-owned enterprises. At the same time, intelligent transformation has weakened the motivation of two kinds of earnings management of enterprises in the eastern region of China but has not had an effective impact on the central and western regions.

Based on the findings discussed earlier, this paper proposes the following recommendations. Companies should leverage the benefits of the digital economy and industrial chain modernization to align with their intelligent transformation strategies effectively. As the government boosts its backing for the intelligent transformation of businesses, it ought to place greater emphasis on enhancing the standards of both internal oversight and external monitoring systems to reduce the earnings management behavior caused by information asymmetry, fostering a robust growth of the capital market.

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