

A Study on The Impact of Digital Transformation of Enterprises on The Quality of Workforce Employment

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Abstract: Digital transformation profoundly affects the transformation of business models and organisational structures and changes the employment situation of employees in companies. By analyzing the relationship between the digital transformation of enterprises and the employment quality of labor force, this paper constructs an employment quality evaluation system to measure the level of employment quality from four dimensions: social protection, employment status, employment ability and employment environment, and empirically analyzes the impact of digital transformation of enterprises on employment quality using fixed asset investment, the proportion of the number of enterprises with e-commerce transaction activities and e-commerce procurement volume, and obtains that the former has a negative effect on digital transformation, while the latter two have a positive effect. Finally, we propose a path to improve the quality of employment in the process of digital transformation of enterprises.

Keywords: Digital transformation of enterprises, Quality of workforce employment, OLS regression analysis, Comprehensive evaluation.

1. Introduction and Literature Review

With the development of digital technology, digital application scenarios have been greatly enriched and the era of digital economy has arrived. China's digital economy has reached 39.8% of GDP in 2021, and its nominal growth is 3.4 percentage points higher than that of GDP in the same period. Digital transformation has become a new economic growth point in the current situation of general lack of economic development momentum. According to the White Paper on the Development of China's Digital Economy (2020) released by the China Academy of Information and Communication Technology, the digital economy has entered a new stage of development and formed a comprehensive development pattern based on data valorisation, digital industrialisation, industrial digitisation and digital governance[1].

The digitalization of industry is the result of the gradual and deep integration of traditional industries with the digital economy. In this process, new business models are emerging, creating new jobs for society, especially in the face of the current recurring new crown epidemic, employment is facing more uncertainty factors, enterprises are looking for new ways out by deepening the application of digitalization, thus, the digital transformation of enterprises has become an irreversible trend. At the same time, the rapid development of the digital economy continues to increase the proportion of tertiary industries, and the optimisation and upgrading of the industrial structure is bound to bring about changes in the employment structure, resulting in short-term structural unemployment. Employment is a top priority for people's livelihoods and an important support for stabilising the economy. The government is constantly introducing employment policies and measures to stabilise and expand jobs, such as stabilising market players, encouraging innovation and entrepreneurship, serving key groups and guaranteeing equal employment, etc. In this context, how to effectively improve the quality of employment for workers has become an issue that enterprises must face in the process of digital transformation.

Most current studies on employment in the digital economy focus on the macro level, from the perspective of digital technologies to the vision of the digital economy, and keep sorting out the mechanism of their impact with total employment, employment quality or employment structure. In the face of AI, early studies argued that it might have an impact on China's economy and labour market, but the scale and structural effects of employment and the impact of income inequality could not be predicted (Jing Cao et al., 2018), and as the level of digital application in society increased, the research attitude gradually shifted from conservative to optimistic, with some studies showing that the development of digital economy on the realization of high-quality employment is reflected in the employment environment, employability, labour remuneration, and labour protection (Yudong Qi et al., 2020). The existing literature on the digital economy and employment quality is mainly developed from the following aspects.

One is the impact of the digital economy on income levels and forms of employment. The digital economy allows for higher incomes in re-employment through the expansion of employment information channels and the expansion of relationship networks (Xiaole Qiao et al., 2021), while some argue that the digital economy leads to the differentiation of jobs at the high and low ends, forming income gaps between industries and causing the substitution of capital for labour (Hao Huang, 2021). Second, the impact of the digital economy on the matching of labour capabilities and jobs. The development of the digital economy has led to industrial upgrading, thus allowing highly educated groups to move more easily to new industries and jobs, and labour is more willing to flow to the high-tech sector (Dongjie Guo et al., 2022). The increase in digital literacy of talents stems from the combined effect of the digital economy and the advanced manufacturing structure, but there is a shortage of digital talents in the manufacturing industry to meet the needs of the rapid development of the digital economy and the upgrading of the manufacturing structure (Huaichao Chen et al., 2022). Third, the impact of the digital economy on employment

service security and rights protection. The relationship between technological innovation and employment has not been found to be necessarily linked. Although the digital economy leads to technological substitution of labour in the short term, there is a long-term growth in total employment (Jianguo Fang et al., 2012), which is due to the fact that employed people affected by changes in industrial structure can move to emerging industries (Hao Huang, 2021). The impact of the digital economy takes into account the differences in employment groups, and the impact on informal employment and entrepreneurship is positive, with younger groups being the biggest beneficiaries (Zongyue He et al., 2020). In terms of gender differences, the digital economy allows workers of different genders to reduce the pay gap after switching jobs (Xiaole Qiao et al., 2021).

Based on the research of various scholars, this paper focuses on the impact of enterprises' digital transformation on labour force employment quality, constructs a comprehensive evaluation system for labour force employment quality, and uses OLS regression analysis to investigate the relationship between enterprises' digital transformation and labour force employment quality in depth, with a view to making some contribution to the research in this direction.

2. Analysis of the Impact Mechanism of Digital Transformation of Enterprises on The Quality of Employment

2.1. Market Scale Effect

Production, distribution, exchange and consumption are the four links of the economic cycle. The digital transformation promotes the formation of a "national unified market", which is conducive to fully tapping the hidden market, expanding domestic demand, expanding the scale of consumption, improving the business performance of enterprises, increasing corporate profits, prompting enterprises to expand and reproduce, increasing employment and driving labour demand[2], this will lead to an increase in demand for labour.

2.2. Business Scope Effect

Digital transformation promotes the deep integration of digital technology and the real economy, empowers the transformation and upgrading of traditional industries, gives rise to new industries and new business models, strengthens new engines of economic development, and injects new momentum into economic development[3]. For example, the digital transformation of enterprises gives rise to innovative R&D, intelligent manufacturing and other businesses, increasing the demand for innovative talents; the digital economy gives rise to new industries, increasing the demand for employees in new industries; the demand for management and operation talents from the digital transformation forces an increase in employment positions, and actually creates a situation with higher requirements for the quality of labour employment.

2.3. Productivity Effect

Digital transformation promotes the increase of total factor productivity of enterprises, and the increase of total factor productivity generates employment creation effect, which plays a positive role in promoting employment; at the same

time, the increase of productivity is accompanied by machinery manufacturing and automation, and production no longer relies on people alone. This means that part of the traditional workforce is at risk of losing their jobs, and the risk of unemployment is rising with the further development of digitalisation, and the pressure on employment is increasing.

2.4. Structural Adjustment Effects

The digital transformation of enterprises is a disruption of the employment structure. On the one hand, the mutual integration of the digital economy and traditional industries has given rise to new industries and new models, creating new jobs; on the other hand, the digital transformation of enterprises has caused many traditional jobs to be severely impacted. With the deep development of digital transformation, traditional labour-intensive industries are gradually eliminated in the market competition[4] and new knowledge-intensive industries rise to break through. This means that employees in traditional industries need to learn digital knowledge and master new skills in order to survive the digital transformation, otherwise it will be difficult to adapt to the digital development wave, or even face the risk of unemployment. In addition, the digitisation of production has placed higher demands on the workforce, and companies are facing an "in-roll" within the industry, which is forcing the employment structure to be optimised.

3. Model Setting and Data Description

3.1. Model Setting

3.1.1. Hierarchical Analysis Method

Hierarchical analysis, referred to as AHP, is a hierarchical weighted decision analysis method. In it, the highest, middle and lowest levels are named for the problem to be solved, the factors to be considered and the decision-making scheme respectively.

(i) Construct a hierarchical model of labour force employment quality

(ii) Constructing a judgment matrix, A_{pq} is an element of it, indicating the result of the comparison of importance between factor p and factor q, and $A_{pq} = \frac{1}{A_{qp}}$

(iii) normalize the eigenvector corresponding to the largest eigenroot in the judgment matrix that is λ_{\max} , and then write it down as ω , the process is called hierarchical single ordering

(iv) need to test the consistency of the above formula, through the consistency indexes that are $CI = \frac{\lambda - n}{n - 1}$ and $RI = \frac{CI_1 + CI_2 + \dots + CI_n}{n}$ to measure

(v) Calculate the total hierarchical ranking

3.1.2. Principal Component Analysis Method

Principal component analysis is a method of recombining indicators that originally have a certain correlation into a new set of independent composite indicators. The usual treatment is to make a linear combination of the original indicators into a new composite indicator. The most classical approach is to express the variance of F1 (the first linear combination selected, i.e. the first composite indicator), i.e. the larger the $Var(F1)$, the more information F1 contains.

3.1.3. Entropy Value Method

The entropy value is used to determine the degree of dispersion of an indicator, and if the degree of dispersion is greater, the greater the influence of the indicator on the

comprehensive evaluation. Before the operation, the indicators need to be normalised; then the entropy value and the coefficient of variation of each indicator are calculated in turn; finally, the weights and comprehensive scores are calculated.

3.1.4. Multiple Linear Regression Model

Multiple linear regression is a regression in which the number of independent variables is two or more. A certain phenomenon is usually related to more than one factor, and the optimal combination of multiple independent variables is used together to predict or estimate the dependent variable, which is more in line with reality. Expressions such as $y = a_0 + a_1x_1 + a_2x_2 + a_3x_3 + \varepsilon$. In this paper, the three indicators of digital transformation of enterprises are the independent variables and the composite score of the quality of labour force employment is the dependent variable.

3.2. Construction of Indicator System and Description of Data

3.2.1. Construction of the Indicator System

In this paper, the explanatory variable is the digital transformation of enterprises, which is quantified as the investment in fixed assets, E-commerce purchases and Share of number of enterprises with e-commerce transaction activities; the explained variable is the quality of labour force employment, with reference to Desheng Lai et al.^[5], and the secondary indicators are social protection, employment status, employability and employment environment, while the tertiary indicators are Number of urban and rural residents' social pension insurance participants, number of people participating in unemployment insurance, registered urban unemployment rate, number of industrially employed persons, education expenses per capita, gross domestic product per capita, number of labour dispute cases handled in favour of workers. For details, see Table 1.

Table 1. Construction of the indicator system

Level 1 Indicators	Secondary Indicators	Tertiary Indicators	Unit
digital transformation of enterprises		Investment in fixed assets	billion
		E-commerce purchases	billion
		Share of number of enterprises with e-commerce transaction activities	%
		Number of urban and rural residents' social pension insurance participants	million people
quality of labour force employment	social protection	Number of people participating in unemployment insurance	million people
	employment status	Registered urban unemployment rate	%
		Number of industrially employed persons	million people
	employability	Education expenses per capita	million people/billion
	employment environment	Gross domestic product per capita	yuan
		Number of labour dispute cases handled in favour of workers	piece

3.2.2. Data Sources

In order to ensure the authenticity of the data and the reliability of the research results, the data used in this paper are mainly obtained from the China Labour Statistics Yearbook, the China Statistics Yearbook and the website of the National Bureau of Statistics, collecting the data of the corresponding indicators for the past ten years, and adopting the interpolation method to supplement the few parts of the data that are missing.

4. Comprehensive Evaluation of The Quality of Labour Force Employment

Before evaluating the three-level indicators under labour force employment quality, the relevant data should be positivized and normalized.

4.1. Positivisation of Data

As the urban registered unemployment rate is a negative

indicator, before proceeding to the next step of analysis, it needs to be positivized and processed into a positive indicator through the formula.

4.2. Normalisation of Data

In order to make the subsequent analysis more concise and to remove the quantitative constraints of each variable, all variables were normalised through the formula, $\frac{A-A_{\min}}{A_{\max}-A_{\min}}$.

4.3. Comprehensive Evaluation Weighting

In order to obtain robust and comprehensive evaluation results, this paper uses a combination of subjective and objective weighting methods, including AHP hierarchical analysis, principal component analysis and entropy method, and finally obtains the most reasonable weight setting by taking the average value.

The results obtained by the combined AHP hierarchical analysis, principal component analysis and entropy method were used to obtain the comprehensive weights as shown in Table 2.

Table 2. Combined weights

Item (A)	Weighting (Q)
Number of urban and rural residents' social pension insurance participants	0.1392
Number of people participating in unemployment insurance	0.1407
Registered urban unemployment rate	0.1239
Number of industrially employed persons	0.1485
Education expenses per capita	0.1529
Gross domestic product per capita	0.1475
Number of labour dispute cases handled in favour of workers	0.1474

5. Analysis of The Impact of Digital Transformation of Enterprises on The Quality of Labour Force Employment

According to the comprehensive evaluation results

obtained earlier, the corresponding weights were obtained, and according to the formula $Y = A_1 * Q_1 + A_2 * Q_2 + A_3 * Q_3 + A_4 * Q_4 + A_5 * Q_5 + A_6 * Q_6 + A_7 * Q_7$, the results of the corresponding dependent variables were calculated as shown in Table 3.

Table 3. Results of dependent variable calculations

Year	Quality of labour force employment	Year	Quality of labour force employment
2013	63567.48	2017	67779.49
2014	68303.98	2018	69953.40
2015	73247.13	2019	75270.83
2016	72293.23	2020	74554.74

All variables were normalised and the results of the correlation analysis were obtained by OLS regression

analysis, as detailed in Table 4.

Table 4. Results of OLS regression analysis

	Regression coefficient
Constants	0.056 (0.849)
Investment in fixed assets	-3.484** (-2.884)
Share of number of enterprises with e-commerce transaction activities	1.617** (3.440)
E-commerce purchases	2.854** (2.782)
Sample size	8
R ²	0.877
Adjusted R ²	0.784
F-value	F (3,4)=15.497,p=0.011

Note: Dependent variable: quality of labour force employment; D-W value: 2.390; * p<0.05, ** p<0.01, t-values in brackets

As can be seen from the table above, the OLS regression analysis was conducted with fixed asset investment, the share of the number of enterprises with e-commerce transaction activities and e-commerce purchases as independent variables and was conducted using Robust robust standard error regression method.

The R² value of the model was 0.877, implying that fixed asset investment, the proportion of enterprises with e-commerce trading activities and e-commerce purchases explained 87.68% of the variation in the quality of labour force employment. An F-test of the model revealed that the model passed the F-test (F=15.497, p=0.011<0.05), which means that at least one of fixed asset investment, the share of enterprises with e-commerce transactions and e-commerce purchases has an impact on the quality of labour force employment and the model equation is: Quality of labour force employment = 0.056 - 3.484* Fixed asset investment + 1.617* share of enterprises with e-commerce transactions + 2.854* e-commerce purchases.

The final analysis shows that: investment in fixed assets has a significant negative impact on the quality of labour force employment; the proportion of enterprises with e-commerce transactions has a significant positive impact on the quality of labour force employment. E-commerce purchases have a significant positive impact on the quality of labour force employment.

6. Conclusions and Suggestions for Countermeasures

This paper collects national data for the past ten years, constructs a comprehensive evaluation system of labour force employment quality from four dimensions: social protection, employment status, employability and employment environment, and analyses the impact of digital transformation of enterprises on labour force employment quality, and obtains the following conclusions: (1) Fixed asset investment has a significant negative impact on labour force

employment quality. (2) The proportion of enterprises with e-commerce transaction activities has a significant positive impact on the quality of labour force employment. (3) The amount of e-commerce purchases will have a significant positive impact on the quality of labour force employment.

The following recommendations are made in light of the findings: (1) Reduce investment in fixed assets in enterprises to improve the quality of labour force employment. (2) Increase the number of e-commerce transactions and related purchases in enterprises to improve the quality of labour force employment.

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