

Research on the Impact of Enterprise Digital Transformation on Work Engagement of Knowledge Employees

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Abstract: While vigorously moving ahead with emerging such as the Internet, Big Data, and Artificial Intelligence, digital technology is increasingly becoming a force that cannot be ignored. The digital transformation of enterprises has become an inevitable choice concerning related to the survival and development of enterprises. Based on cognitive evaluation theory and self-determination theory, this paper explores the impact of enterprise digital transformation on knowledge-based employees' work engagement. This paper adopts a questionnaire survey, the survey sample scope includes Beijing, Shanghai, Yantai, Shenyang, and other cities, and the sample data for enterprise professional and technical knowledge-based employees and management knowledge-based employees. The results of the analysis show that the digital transformation of enterprises has a positive effect on the work motivation of knowledge-based employees, and the work motivation of knowledge-based employees has a positive impact on their work commitment. Further analyses revealed that knowledge employees' work motivation is mediating between enterprise digital transformation and knowledge employees' work engagement. In addition, organizational equity plays a positive moderating role between enterprise digital transformation and knowledge employees' work engagement. This paper is informative regarding managing and motivating knowledge employees during the change period of digital transformation in enterprises.

Keywords: digital transformation, knowledge employees, work engagement, organizational equity, work motivation

1 Introduction

With the rapid development of information technology, the digital economy has become a crucial aspect of the global economic system. In the report of the 20th Party Congress^[1], it has been highlighted that accelerating the development of the digital economy, promoting its integration with the real economy, and creating an internationally competitive digital industry cluster are the key objectives. To achieve this goal, digital transformation has become the key focus. It encompasses the important application of digital technologies such as artificial intelligence, blockchain, cloud computing, big data, and others in enterprise production, service operations, and other business areas. These technologies constitute the core underlying technology architecture for enterprise digital transformation. Digital transformation is viewed as a process of enhancing an entity through information technology, computing technology, communication technology, and connectivity technology, leading to a significant change in the

entity's attributes^[2]. Vial (2019)^[3] has nicely summarised the meaning of digital transformation. Shi Yupeng et al. (2023)^[4] have analyzed the current state of enterprise digital transformation and discussed the challenges faced by it based on extensive survey data. Their analysis aims to promote enterprise digital transformation development and facilitate the upgrading of economic transformation in the future.

In today's business landscape, digital transformation has become a crucial process for companies, bringing significant changes to their development. This transformation affects employees at all levels of the organization, particularly knowledge-based employees who are key to driving information technology within the enterprise. Li Jun (2007)^[5] argues that knowledge employees seek work autonomy, focus on contribution, and have diverse and complex needs. Incentives for such employees should be designed dynamically to promote personal goals consistent with organizational goals. Liao Jianqiao and Wen Peng (2009)^[6] review scholars' understanding of knowledge-based employees worldwide in terms of their definition, characteristics, and classification.

This study presents an in-depth analysis of the impact of digital transformation on the work engagement of knowledge-based employees. However, the dynamic changes within the enterprise alone cannot prompt changes in the thoughts and behaviors of knowledge-based employees. Therefore, this research considers work motivation as an indispensable variable and applies self-determination theory to explore how digital transformation can promote knowledge-based employees' participation in the intrinsic motivational process, thus stimulating work engagement. Additionally, the psychological state of knowledge-based employees is influenced by organizational factors during enterprise digital transformation. Organizational fairness is one of the pivotal drivers, so this paper introduces organizational fairness as a moderating variable following the organizational fairness theory and explores its role in moderating the impact of enterprise digital transformation on knowledge-based employees' work engagement.

2 Theoretical Basis and Research Hypotheses

2.1 Theoretical Basis

2.1.1 Definition of knowledge-based employees

The research object of this paper is knowledge-based employees. Peter Drucker, the master of modern management, first put forward the concept of "knowledge-based employees", and he described knowledge-based employees as "those who master and can use symbols and concepts, and work with knowledge or information"^[7]. Wang Hanbin and Yang Xiaolu (2011)^[8] defined knowledge employees as employees with higher education (college and above). According to scholars' research, this paper defines knowledge-based employees as a group of people whose education is college and above, who are engaged in mental labor and have certain technical and action capabilities.

2.1.2 Self-determination theory

Self-Determination Theory (SDT), a cognitive view of motivation developed by Edward L. Deci & Richard M. Ryan (2000)^[9] after a series of studies, argues that individuals are motivated and have a need for self-actualization and self-growth and that individuals have three basic, innate

psychological needs such as autonomy, competence, and belonging, and aims to study the level of human motivational development^[10].

2.1.3 Organizational equity theory

Organizational equity refers to the reciprocity of value interchange between employees and organizations and is generally based on employees' perception of fairness for organizational valuation^[11]. The study of organizational fairness theory in recent decades has been widely concerned by research scholars at home and abroad, and a series of results have been achieved. Adams' (1965)^[12] classical fairness theory describes organizational fairness as an individual's or group's intuition of the fairness of the organization's treatment of them and classifies organizational fairness into three types in accordance with the three-factor theory: distributional fairness, procedural fairness, and interactive fairness. He argues that the organizational fairness perceived by individual employees is not only affected by the absolute value of the compensation received but also by the relative value.

2.2 Research Hypotheses

2.2.1 Enterprise digital transformation and knowledge of employees' work engagement

Digital technology has undoubtedly increased the development of enterprises, and enterprise digital transformation is a must for some enterprises in the face of a complex change environment, enterprise digital transformation has a certain impact on the external and internal levels of enterprises. Zhou Qiwei, Liu Xin, Li Donghong (2022)^[13] According to the existing research, the image of the external research on the enterprise level mainly focuses on exploring the mechanism and conditions of the impact of operations, knowledge management, innovation, performance, etc., and is still in a relatively scarce stage in the internal aspects of the enterprise on the participation of the employees and employee relations. Research on the knowledge of employees is even thinner. Knowledge employees can bring great advantages to enterprises, for example, they can provide innovative ideas and methods, promote the transformation and upgrading of enterprise philosophy and culture, and enhance the market competitiveness and brand image of enterprises. Digital tools and technologies can simplify repetitive work, and knowledge employees can devote more time and energy to creative and strategic value work, which not only promotes work flexibility to improve efficiency, but also allows knowledge employees to achieve self-learning and innovation based on digital tools to continuously improve their own capabilities. Therefore, following the existing research results, it is believed that there is a certain influential relationship between the digital transformation of enterprises and the work engagement of knowledge-based employees. Thus, Hypothesis 1 is proposed:

H1: Enterprise digital transformation has a positive impact on knowledge employees' work engagement.

2.2.2 Enterprise digital transformation and work motivation

Self-determination theory suggests that individuals are motivated to learn and develop new skills and competencies based on full awareness of their personal needs and information about the environment, and emphasizes that individuals are positive, proactive, curious, and self-motivated in their motivational processes. Zhao Huijun (2000)^[14] believes that "work motivation is intrinsic motivation at work, which motivates employees to work hard to achieve

organizational goals and satisfy their needs". Zhao Yanmei et al. (2016)^[15] analyzed the current status of research on self-determination theory in the field of management, emphasizing the positive role of self-determination theory in the theory of enterprise management and the possibility of applying the theory to enterprises in China. On the basis of self-determination theory, when an enterprise undergoes digital transformation, knowledge employees will respond through work motivation, which triggers the change process within the organization. Jiang Shimei et al. (2017)^[16] argued that work motivation motivates individual behaviors and determines the form and duration of these behaviors. The digital transformation of an enterprise is an important situational factor that may stimulate the work motivation of knowledge-based employees. Zhang Chunhu (2019)^[17] systematically investigated the vein analysis of work motivation based on self-determination theory based on 95 empirical studies on self-determination theory. Thus, following self-determination theory, employees will be motivated to tackle challenging tasks, develop new skills and competencies, and increase their mastery of their work. Accordingly, the article formulates Hypothesis 2:

H2: Enterprise digital transformation has a positive effect on knowledge employees' motivation.

2.2.3 The mediating role of work motivation

Work motivation refers to an internal and external factor that motivates employees to perform their work, which determines the form, direction, intensity, and duration of the work. Cognitive appraisal theory suggests that any event that affects the sense of competence and the sense of self-determination can affect a person's internal motivation and that intrinsic motivation can produce intrinsically motivated behaviors in an individual. Yu Lijuan's (2009)^[18] empirical analysis shows that employees' internal work motivation can play a role in predicting their work engagement and innovative behavior, so when there is work motivation, knowledge employees will be more willing to pursue more challenging work, and they will also get new learning opportunities, new skills, and at the same time work motivation will prompt them to make more engagement behaviors. Ma Qiongfang (2016)^[19] took college teachers in Qinghai Province as the research object to carry out the study, and the results showed that not only the work pressure negatively predict the work engagement, but also achievement motivation plays a negative moderating role between the work pressure and the work engagement, which is specifically manifested in the fact that the stronger the achievement motivation is, the weaker the negative influence of the work pressure on the work engagement will be. Li Wei, Mei Jixia (2013)^[20] According to Zhan Zhiyu's findings, when other conditions are the same, individuals with higher internal drive will spend more time and more effort in the process of problem-solving, and will be more committed to their work and have better persistence and patience. Therefore, Hypothesis 3 is proposed.

H3: Knowledge employees' work motivation mediates the relationship between firms' digital transformation and knowledge employees' work engagement.

2.2.4 The moderating role of organizational equity

According to the equity theory, if a person feels more fairness, his job satisfaction and loyalty will naturally increase. Some scholars have also found that the sense of fairness will have a certain impact on the work commitment of knowledge-based employees^[21] when the Chinese version of UWES is tested for reliability and validity. Feng Mingsheng (2019)^[22] argued that

the sense of organizational fairness of the new generation of knowledge-based employees has a certain influence factor on work engagement. Dong Jianhua and Gao Ying (2019)^[23] unfolded from the perspective of organizational fairness, taking the relationship between work engagement and job performance, and work engagement and job burnout as an entry point to explore the mechanism of the role of work engagement in job burnout. When an individual's perception of organizational fairness is higher, the more the individual believes that his or her efforts can be duly rewarded, and he or she will have more trust and support for the organization, and thus be better committed to the organization's work. When the perception of organizational fairness is not strong, there is a lower work mood. Accordingly, this paper proposes Hypothesis 4:

H4: Organizational equity for knowledge employees has a moderating role between firms' digital transformation and knowledge employees' work engagement.

In summary, the theoretical model proposed by the study is shown in Figure 1.

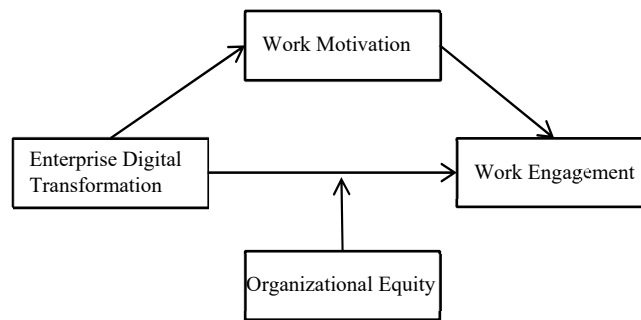


Fig. 1 Theoretical research model

3 Data and Research Methodology

3.1 Data Collection

This paper adopts the method of questionnaire survey, a total of 300 questionnaires were issued, excluding filling in a shorter period of time, the occupation is nonprofessional and technical personnel, management personnel, education for the specialist below the invalid questionnaires a total of 90, the final valid questionnaire 210, the effective questionnaire recovery rate of 70.00%, the research samples are mainly concentrated in the professional and technical and managerial personnel, which in the occupational aspect, professional and technical personnel accounted for 68.10%, management personnel accounted for 31.90%. In terms of gender, women accounted for 44.76%, men accounted for 55.24%. In terms of age, below 25 years old accounted for 34.29%, 26-30 years old accounted for 47.14%, 31-35 years old accounted for 16.19%, and 36 years old and above accounted for 2.38%. In terms of educational background, junior college accounted for 14.76%, bachelor's degree accounted for 34.76%, Master's degree 42.38%, and PhD 8.10% (see Table 1). From these aspects, the sample of the study was able to satisfy the basic situation and meet the requirements of the study.

Table 1 Percentage of demographic variables

Demographic variables	Prerequisite	Quorum	Percent
Careers	Professional and technical category	143	68.10%
	Management category	67	31.90%
Genders	Male	116	55.24 %
	Women	94	44.76 %
Ages	Below 25 years old	72	34.29%
	26-30 years old	99	47.14 %
	31-35 years old	34	16.19 %
	36 years and over	5	2.38 %
Educational Backgrounds	College	31	14.76 %
	Undergraduate	73	34.76 %
	Postgraduate	86	40.95 %
	Doctoral	20	9.52%

3.2 Measurement of Variables

All of the variables studied in this paper were on a 5-point Likert scale, except for the demographic variables. "1" indicates complete disagreement, "2" indicates disagreement, "3" indicates uncertainty, "4" indicates agreement, and "5" indicates complete agreement. The details are shown in Table 2.

4 Empirical Analysis

4.1 Reliability and Validity of the Scale

The overall questionnaire of this paper contains four scales, all of which are from well-established and widely used scales at home and abroad. However, some of the scales have been developed in Western contexts, do they still have reliability and consistency in the cultural context of Chinese natives? Do the scales have good construct validity when important dimensions are excerpted from the original full scale? Do the models estimated from the scales fit the sample data well? All these questions need to be judged by reliability and validity tests.

Table 2 Variables and their measurements

Variant	Selection of scales	Serial number	Title content
Enterprise Digital Transformation (EDT)	The scale is based on the 5-question item scale studied by Meng Fansheng (2018) ^[24] et al.	EDT1	"This enterprise uses digital technology to transform and upgrade existing product services and processes."
		EDT2	"Full roll-out of digital design, manufacturing, and management in enterprises."
		EDT3	"This enterprise develops digitized products and services."
		EDT4	"This business is willing to spend energy to strongly promote and publicize digital skills and management knowledge."
		EDT5	"There is a consensus within this business that the adoption of digital technology and digital management is beneficial to the business".
Work Engagement (WE)	Scale developed by Schaufeli et al. (2002) ^[25]	WE1	"I feel bursting with energy at work."
		WE2	"I feel that the work I do is purposeful and rewarding."
		WE3	"Time always flies when I'm working."

		WE4	"I feel strong and energized when I work."
		WE5	"I am passionate about my work."
Work Motivational (WM)	Scale developed by Liu Yun et al. (2009) ^[26]	WM1	"I am constantly looking for opportunities to develop new skills and knowledge."
		WM2	"I'm very clear about the income goals I'm pursuing."
		WM3	"I am very clear about my goals for promotion."
		WM4	"I'm happier when I can set goals for myself."
		WM5	"I want to know just how well I can get the job done."
Organizational Equity (OE)	Scale developed by Liu Pu et al. (2008) ^[27]	OE1	"My pay rate is fair."
		OE2	"I think I'm relatively fair when it comes to my workload."
		OE3	"My work schedule is fair."
		OE4	"When making decisions about my job, leaders make them in a fair way."
		OE5	"When making decisions about my job, leaders consider my rights as an employee."
Control Variables			Careers (professional and technical, managerial), genders (male, female), ages (below 25, 26-30, 31-35, 36+), educational backgrounds (college, undergraduate, postgraduate, doctoral).

4.1.1 Reliability analysis

The internal consistency coefficient was used to test the reliability of each scale and Cronbach's α coefficient was chosen for judgement. Chen, Xiaoping, Shen Wei(2018)^[28] pointed out that since the purpose of the measurement is only to test the feasibility of the research model, a scale reliability of 0.70 is sufficient for time and effort considerations.

After the statistical analysis of IBM SPSS Statistics 26.0, it was concluded that the Cronbach's α coefficient of each scale was greater than 0.7, indicating that in the empirical study of the factors influencing the work engagement and behavioral effects of enterprise digital transformation on knowledge-based employees, each scale has good internal consistency, can measure the relationship between the constructs stably and accurately, and can continue to be used in subsequent empirical studies. The Cronbach's α of each scale is shown in Table 3.

Table 3 Results of the reliability test for each scale

Scale name	EDT	WE	WM	OE
Cronbach's α	0.836	0.870	0.855	0.747

4.1.2 Validity analysis

The validity of a questionnaire reflects the accuracy of the questionnaire in measuring the qualities of the variables. Many scholars at home and abroad measure the validity of questionnaires from a variety of different tests, and in practice, convergent validity and content validity are widely used. Statistically, the validity (r_{xy}) is defined as the ratio of the variance of the potential true score to the variance of the actual score, i.e.:

$$r_{xy} = \frac{\sigma_x^2}{\sigma_x^2} \cdot \quad (1)$$

4.1.2.1 KMO and Bartlett's test of sphericity

According to Kaiser's view, the suitability of a measure for factor analysis can be determined by the size of the Kaiser-Meyer-Olkin measure for a sufficiently large sample and the significance of Bartlett's Test of Sphericity^[29]. KMO is used to test the existence of skewness in

each variable. KMO is used to test the existence of skewness of each variable, and its value ranges from 0 to 1. The closer the KMO value is to 1, the higher the correlation between the variables, and the better the effectiveness of factor analysis. In practice, it is generally accepted that greater than 0.7 is sufficient, and the closer to 1, the better, data less than 0.5 should not be used for factor analysis, Bartlett's spherical test is mainly used to determine the unit array of the correlation matrix, that is, the degree of correlation between the variables. $p < 0.05$ indicates a significant correlation between the variables, in the case of $p > 0.05$, the variables are independent of each other, and factor analysis cannot be performed. Table 4 shows that the KMO values of the four scales are 0.836, 0.856, 0.850, and 0.759, all over 0.7. Bartlett's spherical test for the four scales gives all the P-values of 0.000, which indicates that the data from the questionnaires on enterprise digital transformation, work engagement, work motivation and organizational fairness are suitable for factor analysis.

Table 4 KMO and Bartlett's test of sphericity

		EDT	WE	WM	OE
	KMO Value	0.836	0.856	0.850	0.759
Bartlett's test of sphericity	Approximate Chi-square (math.)	377.993	473.241	425.815	219.983
	Degrees of freedom	10	10	10	10
	Significance Level	0.000	0.000	0.000	0.000

4.1.2.2 Validated factor analysis

Validity analysis includes three aspects, namely content validity, convergent validity, and discriminant validity. In this paper, we have chosen the more mature and authoritative scales at home and abroad in the questionnaire design session, so we will not conduct a separate test on content validity, structural validity usually has two expressions, one is convergent validity, which is mainly used to evaluate the expressive power of the index to the measured constructs, and the other is discriminant validity, which is mainly used to measure whether there is a clear difference between different measurement indexes.

The aggregation validity generally depends on the values of the standardized factor loading coefficients and CR, and a CR value greater than 0.7 indicates good aggregation validity of the measurement model. Table 5 shows that the factor loading coefficients of the scales are all greater than 0.5, and the CR values are all greater than 0.7, which indicates that the scales selected in this paper are standardized and valid, and can be used to analyze the data to a deeper extent.

4.2 Common Method Bias Test

In this paper, Harman's single factor analysis was used to factor analyze the variables. The specific idea of the method is to load all the variables together in an exploratory factor analysis and test the factor loadings for the purpose of performing the rotation, and thus analyze the number of factors that explain the variance of the variables. If the factor analysis produces a single factor or a single factor that explains a large portion of the covariance between the measured question items, then a common bias exists^[30]. In this paper, all the question items were put together for factor analysis, where the first principal component that was not rotated was the amount of common method bias, and if this amount did not account for the majority, common

method bias was not able to influence the findings. Following the above methodology, the analysis revealed that three factors had an eigenroot greater than 1, yielding a first principal component of 27.82%, which did not exceed 40%, indicating that the common method bias in this paper is not serious. Therefore, this paper passes the test criteria.

Table 5 Results of the aggregation validity representation of the scales

Variant	Measurement indicators	Standardized factor loadings	S.E	P	CR
EDT	EDT1	0.659			
	EDT2	0.709	0.114	***	
	EDT3	0.789	0.122	***	0.844
	EDT4	0.708	0.131	***	
	EDT5	0.738	0.132	***	
WE	WE1	0.788			
	WE2	0.760	0.097	***	
	WE3	0.785	0.102	***	0.869
	WE4	0.715	0.100	***	
	WE5	0.724	0.096	***	
WM	WM1	0.727			
	WM2	0.767	0.115	***	
	WM3	0.730	0.101	***	0.851
	WM4	0.737	0.106	***	
	WM5	0.687	0.113	***	
OE	OE1	0.500			
	OE2	0.603	0.139	***	
	OE3	0.583	0.129	***	0.733
	OE4	0.629	0.143	***	
	OE5	0.659	0.123	***	

Note: * indicates $P < 0.05$, ** indicates $P < 0.01$, *** indicates $P < 0.001$

4.3 Descriptive Tests and Correlation Analyses

Descriptive statistics and correlation analysis between the variables were performed using IBM SPSS Statistics 26.0. Table 6 demonstrates the means, standard deviations, and correlation coefficients of the variables. There is a positive correlation between enterprise digital transformation and work engagement ($p < 0.01, r = 0.673$), a positive correlation between enterprise digital transformation and work motivation ($p < 0.01, r = 0.684$), a significant positive correlation between work motivation and work engagement ($p < 0.01, r = 0.758$), and organizational fairness positively moderates knowledge employees' work engagement ($p < 0.01, r = 0.134$). At the same time, there is a correlation between the occupation, gender, and education of knowledge-based employees and the research variables, therefore, to ensure that the results of the study will not be influenced by other factors, occupation, gender, age, and educational background are used as control variables in this study.

4.4 Hypothesis Test

4.4.1 Structural equation modeling

Structural equation modeling (SEM) is a statistical method for analyzing the relationship between variables based on their covariance matrix. It is usually considered that a chi-square degrees of freedom ratio of less than 3 represents a better fit of the model. GFI refers to the general goodness-of-fit index, IFI refers to the value-added fit index, and CFI refers to the comparative fit index. Usually, the GFI, IFI, and CFI should be greater than 0.9, which indicates

that the model has a good fit index. When the RMSEA, which represents the root mean square of the approximation error, is lower, the model fit is better, and generally, at less than 0.08, it indicates that the model fits reasonably well. SRMR, which refers to the standardized residuals, should be less than 0.05.

As can be seen from the data in Table 7, the fitting indicators basically meet the requirements, indicating that the model is acceptable.

Table 6 Analysis of descriptive statistics and correlation results between variables

	M	SD	Careers	Genders	Ages	Educational Backgrounds	EDT	WE	WM	OE
Careers	1.32	0.47	1							
Genders	1.45	0.50	0.020	1						
Ages	1.87	0.77	0.374**	-0.094	1					
Educational Backgrounds	2.45	0.858	0.342**	0.117	0.121	1				
EDT	4.23	0.57	0.193**	-0.069	0.132	0.334**	1			
WE	4.33	0.58	0.152*	0.075	0.041	0.300**	0.673**	1		
WM	4.44	0.54	0.076	0.037	0.055	0.286**	0.684*	0.758**	1	
OE	4.33	0.56	0.053	-0.048	0.032	0.170*	0.260**	0.134**	0.269**	1

Note: ** indicates a significant correlation at the 0.01 level (two-tailed). * indicates a significant correlation at the 0.05 level (two-tailed)

Table 7 Validation factor fit indices

Norm	χ^2	DF	χ^2/DF	GFI	IFI	CFI	RMSEA	SRMR
Fitness Index	247.557	161	1.538	0.902	0.955	0.954	0.051	0.0436

As shown in Table 8, there is a positive and significant effect between enterprise digital transformation and work engagement ($p < 0.001$, $\beta = 0.789$), i.e., the stronger the enterprise digital transformation, the greater the work engagement of knowledge-based employees, which verifies H1, there is a positive and influential relationship between enterprise digital transformation and work motivation ($p < 0.001$, $\beta = 0.811$), i.e., enterprise digital transformation increases knowledge-based employees' work motivation, validating H2.

Table 8 Structural equation modeling road test coefficients

	Standardized Factor loadings	S.E.	P	Test results
EDT --> WE	0.789	0.025	***	approve
EDT --> WM	0.811	0.024	***	approve

Note: * indicates $P < 0.05$, ** indicates $P < 0.01$, *** indicates $P < 0.001$.

4.4.2 Intermediary test

The test was conducted using IBM SPSS Statistics 26.0 and distributional regression was used for the mediation test (see Figure 2), the results of the mediation test are shown in Table 9, which shows that this mediation model is partial.

Table 9 Distributed regression method for a mediation effect test

Modeling	Model I		Model II		Model III	
Implicit Variable	WE		WM		WE	
Norm	β	t	β	t	β	t
Constant	0.896	3.403	1.005	4.065	0.306	1.338
EDT	0.673	13.131***	0.684	13.514***	0.291	4.958***
WM					0.559	9.505***
R-square	0.453		0.468		0.619	
Adjusted R-square	0.451		0.465		0.616	
F	172.422***		182.616***		168.413***	

Note: * indicates $P < 0.05$, ** indicates $P < 0.01$, *** indicates $P < 0.001$.

According to the above mediation effect test of distributional regression method, it can be seen that in the first step (Model I) there is a significant effect relationship of enterprise digital transformation on work engagement ($\beta = 0.673$, $p < 0.001$), which indicates that the total effect is established, in the second step (Model II), $\beta = 0.684$, $p < 0.001$, which again verifies the H2: enterprise digital transformation has significant effect relationship on the work engagement of knowledge-based employees' work motivation, while in the third step (Model III) test, the effect of enterprise digital transformation on work engagement is significant ($\beta = 0.291$, $p < 0.001$), and there is a significant effect of work motivation on work engagement ($\beta = 0.559$, $p < 0.001$), which in turn verifies the relationship between H3: Knowledge-based employees' work motivation plays a mediating role between enterprise digital transformation and knowledge-based employees' work engagement and is part of the intermediary.

Based on the results of the coefficient test it is possible to calculate the indirect effect of intermediation: $0.684 * 0.559 / 0.673 * 100\% = 56.8\%$, the share of the direct effect is: $0.291 / 0.673 * 100\% = 43.2\%$.

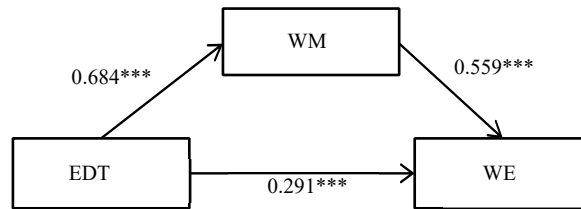


Fig. 2 Diagram of the path relationship for the mediated effect test

4.4.3 Regulatory effect

Hierarchical regression was used to test whether organizational equity moderates the relationship between firms' digital transformation and employees' work engagement. The full data were centered (also known as standardized) and the product terms of the centered independent and moderator variables replaced the interaction terms. First, the control variables (occupation, gender, age, and education) were included in the regression equation, second, the standardized treatment of enterprise digital transformation and organizational equity were included in the regression equation, and finally, the interaction effect of the standardized treatment of enterprise digital transformation and organizational equity was included in the regression equation. According to M4 in Table 10, the moderating effect of enterprise digital transformation and organizational fairness is significant ($p < 0.05$), indicating that the higher the

perception of organizational fairness of knowledge-based employees, the stronger the positive impact of enterprise digital transformation on knowledge-based employees' work motivation. Therefore, H4 is tested.

Table 10 Results of the test of the moderating role of organizational equity

Variant		Outcome Variable: WE			
		M1	M2	M3	M4
Control Variable	Careers	0.835	0.409	0.387	0.608
	Genders	0.644	2.099*	2.054*	2.110
	Ages	-0.163	-0.950	-0.954	-1.362
	Education Backgrounds	3.855***	1.139	1.221	1.077
Independent variable	EDT		12.135***	12.037***	12.335***
Moderator variable	OE			-0.883	-1.038
Interaction Term	EDT*OE				2.167*
R2		0.095	0.474	0.476	0.488
Adjust R2		0.077	0.461	0.461	0.471
F		5.374***	36.818***	30.778***	27.532***
ΔF		5.374***	147.259***	0.779	4.695*

Note: * denotes $p < 0.05$, ** denotes $p < 0.01$, *** denotes $p < 0.001$.

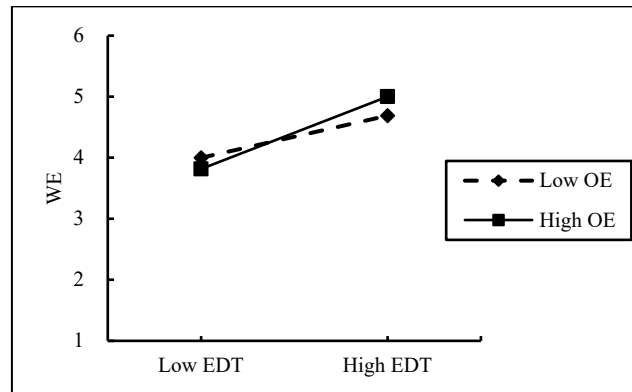


Fig. 3 The moderating role of organizational equity

Using IBM SPSS Statistics 26.0 Process plug-in for analysis, the coefficients of the variables of the high and low groups were obtained and plotted as the slope effect test graph shown in Figure 3, from which it can be seen that the two curves have different slopes and a clear cross-trend, which indicates that organizational fairness is equipped with a moderating effect between the digital transformation of the enterprise and the work engagement of the knowledge-based employees. For the two groups of knowledge-based employees, it can be seen that the relationship between high organizational equity, enterprise digital transformation, and employee work engagement is positive, i.e., for higher organizational equity, the higher the degree of digital transformation of the enterprise for knowledge-based employees, the greater the employee's work engagement. Once again, H4 is validated.

5 Conclusions and Discussion

5.1 Conclusion

Based on Self-determination theory and Organizational equity theory, this paper investigates the impact of enterprise digital transformation on knowledge-based employees' work engagement and tests the role of organizational fairness and work motivation of knowledge-based employees in the process of its impact. Through empirical analyses and data testing studies on 210 valid questionnaires of knowledge employees affected by digital transformation, the results show that enterprise digital transformation promotes knowledge employees' work motivation, which further promotes the degree of employees' work engagement. The degree of knowledge employees' perception of organizational fairness affects the work engagement of knowledge employees through enterprise digital transformation. When employees' perception of organizational fairness is stronger, the greater the impact of an enterprise's digital transformation on knowledge-based employees' work engagement, conversely, the smaller.

5.2 Limitations

The findings of this paper are valid, but there are still some limitations. For one thing, the 210 valid sample data used in this paper are in line with the sample capacity, but the sample data is limited, and the research results may not be fully applicable to all digital transformation enterprises, for another, this paper mainly uses cross-sectional data to understand only the psychological and behavioral state of knowledge employees at a certain point in time, and it is difficult to ensure that the research conclusions do not change with the change of time. Moreover, the research process will be influenced by individual knowledge employees' personal subjective factors, which may interfere with the objectivity and reliability of the research conclusions.

5.3 Discussion

The main body of this paper is the impact of knowledge-based employees in the digital transformation of enterprises on their work commitment, the results show that the digital transformation of enterprises will have a positive impact on the work commitment of knowledge-based employees, then in the traditional enterprises, different industries, knowledge-based employees, whether this work commitment will be the same can be the next focus of our discussion. In the next study, we can continue to expand the sample capacity and increase the sample coverage to improve the general applicability of the findings or use more objective data to analyze and exclude the subjectivity brought by the questionnaires and interviews, so as to make the results more real and convincing.

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