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Study on the Mechanism and Countermeasures of Digital Transformation Affecting Enterprise Performance in Xi'an Aerospace Manufacturing Industry

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Abstract: *This paper uses 306 valid questionnaires of Xi'an aerospace manufacturing enterprises to test the impact of digital transformation on enterprise performance. It is found that digital transformation improves enterprise performance, and behavioral integration plays a complete intermediary role in this process. Further research shows that digital transformation plays a positive role in three dimensions: information sharing, mutual assistance and cooperation, and joint decision making. The research results not only expand the research on the economic consequences of digital transformation, but also expand the research on the influencing factors of enterprise performance, which has important implications for enterprises to promote digital transformation. In addition, this study applies the competition and cooperation theory widely used in enterprise organizations to the performance study of enterprise digital transformation, enriching the research field of competition and cooperation theory and providing a new perspective and new ideas for the relationship between digital transformation and enterprise performance.*

Keywords: *Digital transformation, Enterprise performance, Aerospace manufacturing, Xi 'an City*

1. Introduction

With the rapid development of emerging digital technologies such as cloud computing, big data, Internet of Things, block-chain and artificial intelligence, enterprises' digital transformation has become an important engine to improve performance, establish sustainable competitive advantages and tap potential opportunities. The COVID-19 pandemic has accelerated the pace of enterprises' digital transformation. In the digital wave, the transformation process from traditional manufacturing to advanced manufacturing is accelerating. As an important part of Xi 'an's dominant industries, aerospace manufacturing industry takes the lead in transformation and plays an exemplary role. At the same time, digital technology has a natural advantage in the application of high technology in aerospace manufacturing. How to take advantage of this opportunity to take the lead in transformation has become the focus of the theoretical and business circles [1].

2. Data Source and Sample

The data used in this paper are from a nationwide survey on digital transformation and enterprise performance conducted from March to June 2023. The survey objects are enterprises nationwide, and the questionnaires are filled by senior managers of enterprises. The questionnaire covers a total of 48 questions from three dimensions: digital transformation, organizational conflict and enterprise performance, which can comprehensively understand the adoption of enterprise digital technology, the specific degree of task conflict, relationship conflict, process conflict and status conflict in the organization, as well as the performance of enterprise operation. This survey uses the questionnaire star survey platform to obtain data by sending questionnaires online due to the COVID-19 epidemic. In this survey, 702 valid questionnaires were finally collected. For the convenience of the study, samples whose response time was less than 1000-3000 seconds, samples that did not conform to the study

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situation (those who were younger than 25 years old, held positions of non-senior managers and did not adopt any digital technology) and invalid samples with many missing values were excluded. Finally, 306 valid samples were obtained for this study, with a recovery rate of 43.59%. The descriptive statistical analysis of the surveyed enterprises and respondents is shown in Table 1 [2-4].

Table 1: Descriptive statistical analysis of surveyed enterprises and respondents

Enterprise Characteristic				Interviewee Characteristics			
Property	Classify	Sample Size	Percentage	Property	Classify	Sample Size	Percentage
Enterprise Age	Less than 5 years	30	9.80%	Sex	Male	179	58.50%
	5 to 10 Years	83	27.12%		Female	127	41.50%
	10 to 15 Years	86	28.10%	Age	25 to 35 years old	173	56.54%
	15 to 20 Years	67	21.90%		35 to 45 years old	110	35.95%
	20 to 25Years	29	9.48%		Over 45 years old	23	7.52%
	More than 25 Years	11	3.59%	Degree of Education	Junior college and below	13	4.25%
Enterprise Scale	Less than 100	52	16.99%		Undergraduate	209	68.30%
	100 to 299	68	22.22%		Graduate student (Master/Doctor)	84	27.45%
	300 to 499	58	18.95%				
	499 to 999	61	19.93%	Industry Distribution	Information Technology	125	40.85%
	1000 to 1499	36	11.76%		Manufacturing industry	139	45.42%
	More than 1500	31	10.13%		Service industry	42	13.73%
Ownership	State-owned Enterprise	42	13.73%	Digital Technology Adoption	Big data technology	270	88.24%
	Private Enterprise	221	72.22%		Internet of things technology	197	64.38%
	Foreign-owned Enterprise	43	14.05%		Cloud computing technology	204	66.67%
					Intelligent technology	168	54.90%

3. Variable Measurement

Table 2: Variable Definition table

Variable	Symbol	Variable Declaration
Independent Variable	DT	Digital transformation
Dependent Variable	FP	Enterprise performance
Mediating Variable	IC	Behavioral integration
	IS	Information sharing
	MC	Mutual assistance and cooperation
	JD	Joint decision making
Control Variable	Size	Enterprise size: the number of existing employees
	Age	Enterprise age: (2022-year of establishment)
	Ownership	Type of ownership (dummy variable)
	Type	Industry type (dummy variable)
Marker Variable	MV	Interviewee's shoe size

All the data in this paper were collected through questionnaires, and the measurements of the three constructs in this study were adapted from the existing mature scale and the research context in this paper. Specifically, the four items of digital transformation are adapted from the scales of Li and Cui

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(2020) and Faruquee et al. (2021). Behavioral integration includes three dimensions: information sharing, mutual assistance and cooperation, and joint decision making. The 9 items measured by behavioral integration are adapted from the scale of Simsek et al. (2005). The five items of enterprise performance are adapted from the scale of Vickery et al. (2003) and Li and Cui (2020). All the above constructs were measured using the 7-point Likert scale for variable measurement, with "1" representing strongly disagree or very slow, and "7" representing strongly agree or very fast. The scale includes control variable items such as enterprise scale, enterprise age, ownership type and industry type. See Table 4-2 for variable definitions and Table 2 for specific measurement items [5-6].

4. Reliability and Validity Test and Common Method Deviation

4.1. Reliability and Validity Test

SPSS25.0 and AMOS24.0 software were used in this study to test the reliability and validity of the data, and the results are shown in Table 4-3. In terms of reliability, Cronhach's coefficient of latent variables in the theoretical model (0.835~0.880) and CR estimate of combinatorial reliability (0.810~0.865) both exceeded the good level of 0.8 suggested by Fornell and Larker (1981). Therefore, the scale had good internal consistency. Good reliability. In terms of validity, first of all, subscales on digital transformation, organizational conflict and enterprise performance have been recognized in domestic and foreign studies, and the Bartlett sphericity test values (576.592~2578.01) reach the significance level ($p<0.000$). The cumulative explanatory variance of each variable (62.116~80.340) was greater than 60%, and the KMO value (0.855~0.944) was greater than 0.7, indicating that the contents of the item could explain most of the information of this variable, and had good content validity. Secondly, confirmatory factor analysis (CFA) was used to test the convergent validity of all latent variables. All standardized factor loads (0.682~0.902) are greater than the requirement of 0.6 suggested by Nunnally (1978), and the p value is significant at the level of 0.01, indicating that the measurement questionnaire has good convergent validity. Thirdly, AVE values of average extraction variances (0.727-0.859) all exceeded the acceptable level (0.5), and the square root of AVE was greater than the correlation coefficient between any construct (see Table 4-4), indicating that the measurement questionnaire had good discriminant validity. Finally, the indicators of model fitting are as follows: ^{2}=620.879, df=215, ^{2}/df=2.89, IFI=0.973, TLI=0.967, CFI=0.972, RMSEA=0.040. In view of all important indicators, the model test results reach a good level. Therefore, the reliability and validity of the scale used in this study and the fit degree of the overall theoretical model meet the requirements [7-9].

Table 3: Measurement items of variables and reliability and validity test.

Variable	Extraction factor	Measurement item	Factor Loading	Cumulative explanatory variance(%)	Cronbach's α	CR	AVE	KMO	Bartlett	
									chi-square	Sig.
digital transformation	digital transformation	Your company's goal is to use digital transformation in order to maintain relationships with existing partners.	0.750	62.994	0.852	0.853	0.538	0.858	598.518	0.000
		Your company's goal is to use digital transformation to build business relationships with new partners.	0.724							
		Your company's goal is to use digital transformation to handle external communication with corporate stakeholders.	0.729							
		Your company's goal is to use digital transformation for marketing at the project level.	0.764							
		Your company's goal is to use digital transformation for strategic planning at the corporate level.	0.697							
behavior integration	Information sharing	In your company's digital transformation, team members are exchanging ideas.	0.762	77.700	0.866	0.865	0.683	0.944	2578.01	0.000
		In your company's digital transformation, team members	0.844							

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		exchange solutions with each other.								
		In your company's digital transformation, team members exchanged ideas with each other.	0.902							
	Mutual assistance and cooperation	In your company's digital transformation process, other team members will volunteer to share heavy tasks.	0.793	75.020	0.835	0.830	0.629			
		During your company's digital transformation, team members have the flexibility to shift responsibilities in order to work with each other more smoothly.	0.881							
		Team members are willing to help each other get things done and meet deadlines during your company's digital transformation.	0.696							
	Joint decision making	During your company's digital transformation, team members will inform each other when their actions affect others.	0.865	80.340	0.880	0.810	0.648			
		In your company's digital transformation, your team members have a clear understanding of the common problems and needs of others.	0.839							
		During your company's digital transformation, team members often discussed expectations for each other.	0.819							
Enterprise performance	Enterprise performance	The growth rate of your company's sales returns over the past three years.	0.704	62.116	0.847	0.848	0.528	0.855	576.592	0.000
		Your profit growth rate over the past three years.	0.682							
		The growth rate of your company's return on investment over the past three years.	0.751							
		Your sales growth rate in the past three years.	0.718							
		Over the past three years, your return on assets.	0.773							

Note: Principal component analysis is adopted, and the values in the table are the standard factor loading after Varimax rotation.

4.2. Common Method Bias

Since each questionnaire filling process is completed by the same person at the same time, there may be homologous bias (Podsakoff et al., 2003), so the marked variable technique is adopted to test whether it is seriously affected by this problem. Referring to the research of Lindell and Whitney (2001), the shoe size of the interviewee was used as the marker variable. The results are shown in Table 4. There is no significant correlation between marker variables and other variables, and there is no serious common method bias problem. Therefore, relevant empirical tests can be further conducted.

5. Descriptive Statistics and Correlation Analysis

Descriptive statistics and correlation analysis were conducted on variables in this paper, and the results were shown in Table 4. Pearson correlation coefficients of each variable were all less than 0.7. Meanwhile, variance inflation factor (VIF) test was conducted for independent variables, and VIF (1.153~2.324) of each variable was less than 10, so there was no serious multicollinearity problem. By observing the significance of the correlation coefficient, it can be found that the independent variable (digital transformation) has a significant positive correlation with the intermediary variable (information sharing, mutual assistance and cooperation, joint decision-making), and the intermediary

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variable (information sharing, mutual assistance and cooperation, joint decision-making) has a significant positive correlation with the dependent variable (enterprise performance), which preliminarily supports the theoretical hypothesis of this paper. It is suitable for further regression analysis of the model [10].

Table 4: Correlation analysis, discriminant validity and variance inflation factor analysis

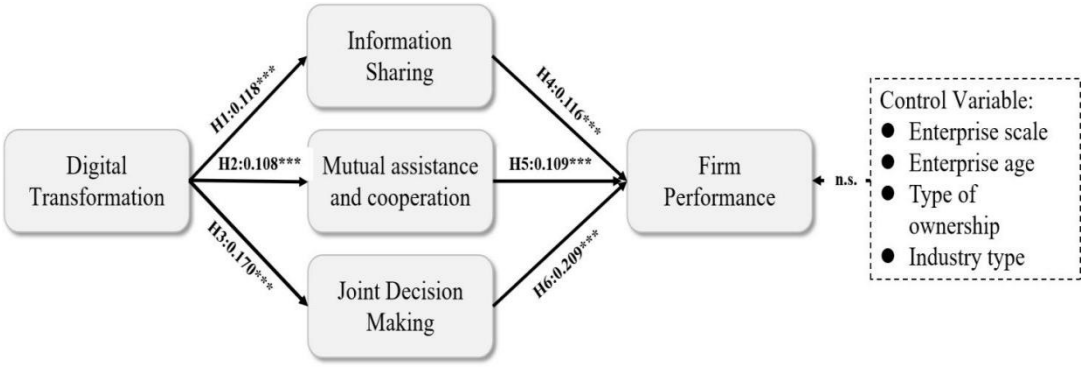
	Mean	SD	DT	IS	MC	JD	FP	VIF
DT	5.786	0.715	0.793					1.153
IS	4.998	1.379	0.191***	0.783				1.962
MC	5.250	1.352	0.169***	0.840**	0.796			1.873
JD	4.814	1.397	0.187***	0.544**	0.528**	0.859		2.324
FP	5.267	0.655	0.399**	0.129*	0.050	0.173**	0.727	n/a
MV	n/a	n/a	0.031	0.055	-0.022	-0.080	0.062	n/a

Note: * means P<0.05, ** means P<0.01, and the square root of all AVE is on the diagonal.

6. Test of Main Effect and Intermediate Effect

In this paper, the structural equation model (SEM) is used to test the main effect and the intermediate effect, and the results are shown in Figure 1. The fitting indexes of SEM are as follows: δ2=620.879, df=215, δ2/df=2.89, IFI=0.973, TLI=0.967, CFI=0.972, RMSEA=0.040. These indexes show that the fitting degree of SEM is good on the whole.

The empirical results show that, in terms of the relationship between digitalization and behavioral integration, although digital transformation has positive effects on information sharing (β=0.118), mutual assistance and cooperation (β=0.108), joint decision making (β=0.170), and it is significant at the 1% level. Therefore, hypothesis H1, H2 and H3 are all supported. In terms of the relationship between behavioral integration and firm performance, information sharing (β=0.116), mutual assistance and cooperation (β=0.109), joint decision making (β=0.209) all have positive effects on firm performance, and it is significant at 1% level. Therefore, the hypothesis H4, H5, and H6 are also supported. Finally, in terms of control variables, firm size, firm age, ownership type and industry type have no significant relationship with firm performance.



*Note: *** means P<0.01*

Figure 1: Test results of structural equation model.

In this paper, Bootstrapping was used to test the mediating effect, and the results are shown in Table 5. It can be seen that the indirect effect of digital transformation on enterprise performance is not included in the upper and lower limits of the 95% confidence interval (0.020~0.605) of Bootstrapping method and the 95% confidence interval (0.016~0.614) of Percentile. It shows that the indirect effects of digital transformation on enterprise performance are 0.203, 0.108 and 0.211 ($p < 0.01$), and the mediating effects are significant. Therefore, the mediating effects of information sharing, mutual assistance and cooperation, and joint decision-making are verified, that is, hypotheses H1~H6 are proved again. The total effect of digital transformation on enterprise performance was 0.887 (0.887=0.365+0.203+0.108+0.211, $p < 0.01$).

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Table 5: Test results of the impact model of "digital transformation→behavior integration→enterprise performance".

Relational Path	Effect	Boot S.E.	Z	P	Bias-Corrected 95% CI		Percentile 95% CI	
					Lower	Upper	Lower	Upper
Digital transformation→ enterprise performance	0.365	0.048	7.591	0.000	0.318	0.605	0.323	0.614
Digital transformation→ Information sharing	0.134	0.042	1.620	0.000	0.038	0.242	0.030	0.233
Information sharing→enterprise performance	0.066	0.017	2.023	0.000	0.048	0.139	0.046	0.137
Digital transformation→ information sharing→enterprise performance	0.203	0.024	4.254	0.000	0.054	0.007	0.049	0.004
Digital transformation→Mutual assistance and cooperation	0.071	0.023	0.853	0.000	0.020	0.138	0.016	0.117
Mutual assistance and cooperation→enterprise performance	0.035	0.009	1.063	0.000	0.027	0.075	0.023	0.073
Digital transformation→Mutual assistance and cooperation→ enterprise performance	0.108	0.013	2.263	0.000	0.029	0.004	0.026	0.002
Digital Transformation→Joint decision making	0.139	0.044	1.666	0.000	0.039	0.276	0.031	0.230
Joint decision-making→ enterprise performance	0.069	0.017	2.077	0.000	0.054	0.147	0.045	0.143
Digital transformation→Joint decision making→enterprise performance	0.211	0.025	4.421	0.000	0.057	0.008	0.051	0.004

7. Research Conclusions

Through a questionnaire survey and using statistical software SPSS 25.0 and AMOS24.0, this paper empirically analyzes how digital transformation affects enterprise performance, discusses the mediating role of behavior integration and team conflict, and then concludes the action path of "digital transformation→behavior integration→enterprise performance" and "digital transformation→task conflict→enterprise performance". The main conclusions are as follows:

First, on the whole, digital transformation has a significant positive impact on enterprise performance. This means that in the digital era, enterprise organizations should realize the improvement of enterprise performance, make full use of the first-mover advantage brought by technological change, consider appropriate digital transformation strategy combined with enterprise reality, and improve enterprise performance through digital empowerment.

Second, from the action path of "digital transformation→behavior integration→enterprise performance", behavior integration plays an intermediary role between digital transformation and enterprise performance. Digital transformation can realize organizational information sharing, mutual assistance and cooperation, and joint decision-making empowerment, so as to promote the improvement of enterprise performance. Therefore, the above three capabilities are the functional mechanisms for realizing the integration of organizational behavior. In the process of building the integration of organizational behavior, enterprises should not ignore the construction of mutual assistance, cooperation and joint decision-making while emphasizing information sharing.

Third, this topic puts forward the path and countermeasures of digital transformation to improve enterprise performance: (1) Design the four-dimensional linkage implementation path of "accelerating transformation process, carrying out technological innovation, promoting model innovation, and building property rights protection"; (2) To build a four-in-one support system of "technology

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application, capital investment, talent introduction and platform construction"; (3) Formulate a four-wheel drive response strategy of "digital infrastructure construction, organizational process transformation, data innovation-driven, and user value creation".

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