



Improving Individual Digital Literacy in the Digital Era: From the Perspective of Learning

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Abstract. Digital transformation, including adoption of various digital technologies such as artificial intelligence, algorithm, information-computer technology, is prevalent in nowadays organizations. Extant research proposes that digital transformation has claimed new job demands and brought up challenges and difficulties for employees to adapt to the new digital workplace. This paper aims to seeks idea to promote employees' adaptivity from the perspective of learning. It intends to set theoretical and empirical linkages between digital transformation and favorable workplace outcomes through the mediating role of individual learning. Drawing from two-wave survey data collected from 433 Chinese employees, this study conducts hierarchical linear regression analyses and proves that digital transformation promotes individual learning. Moreover, digital transformation further enhances job performance, adaptive performance and innovative performance via learning.

Keywords: digital transformation; individual learning; job performance; adaptive performance; innovative performance

1 Introduction

Digital transformation is not only a long-term development strategy for organizations to integrate into the global digital economy industry chain and achieve healthy and sustainable operation, but also a favorable grasp for organizations to respond to unexpected crises, reduce operational survival risks, and achieve transformational change and leap-frog development. Digital transformation refers to the process of bringing about significant changes in organizational attributes through the adoption of a combination of information, computing, communication, and connectivity technologies, in order to achieve overall improvement [1-3]. Although the number of domestic and foreign studies on digital transformation has grown by leaps and bounds, the focus of extant studies on digital transformation is mostly on exploring the direction and strategic implementation path of digital transformation [3,4], and on demonstrating the positive effects of digital transformation such as optimizing resource allocation, improving collaboration

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efficiency, enhancing decision-making accuracy, creating customer value, and reshaping business ecology [5,6]. There are few studies address internal management issues during and after digital transformation.

It is worth pointing out that digital transformation has not only brought about changes in business models, but also triggered a transformation in jobs, which largely impact the existing labor market and aggravate the risk of structural unemployment. In fact, individuals are not only passively affected by the digital transformation process, but more importantly, achieving products, technologies, management operations and all aspects digitalization are more dependent on the improvement of individual digital literacy. Thus, it is of importance to address the lack of digital literacy among employees in the process of digital transformation.

In order to promote the deepening of digital technology empowerment, establishing a learning organization, training individuals to learn and skillfully use new tools and equipment such as fully automated machines, control platforms and mobile terminals are crucial. Thus, this study stresses the important role of promote individual learning in the digital era. We posit that through learning, individuals not only master new knowledge, acquire proficient operation methods of digital equipment, and re-adapt to the job requirements of digital positions, but also cultivate digital thinking, establish advanced digital strategic views and concepts, and thus contributes to create a harmonious digital organizational interaction mode. The enhancement of individual digital literacy could fundamentally improve individuals' ability to adapt to the digital development of the organization, improves individual and organizational performance, which in turn contributes to the advancement of digital strategy process.

In summary, this study articulates the important role of individual learning in the context of digital transformation, and set linkages between digital transformation and favorable workplace outcomes through learning. We test the hypotheses with two-wave survey data collected from 433 Chinese employees.

2 Hypotheses development

2.1 Individual learning in digital transformation

Individual learning has always been one of the key topics in organizational development. Learning is an important tool for individuals and organizations to cope with the unprecedented opportunities and challenges that the current complex and changing social, economic and technological environment brings to organizations. The rapid iterations of information, products and even business rules mean that decision makers will face unprecedented complexity and difficulties in the decision-making process. Thus, learning is the fundamental way to adapt to changes and create new competitive strengths. In this context, individual learning that emphasizes continuous knowledge acquisition, behavioral improvement, and system optimization to continuously adapt to the internal and external environment will become an inexhaustible driving force for the healthy, sustainable, and harmonious development of organizations and their members [7]. Existing studies show that learning will help limited-rational decision makers

reduce uncertainty, lower search costs, and compensate for internal information deficiencies and shortcomings. Also, learning helps individuals decide on action steps, improves decision quality, improves subsequent business strategies, and facilitates problem solving, as well as reduce the likelihood of failure and promote innovation, ultimately leading to improved performance at all levels, including individual [8], team [9], and organizations [10]. Thus, we propose:

Hypothesis 1: Digital transformation is positively related to individual learning.

2.2 The mediating role of individual learning

Digital technology and digital transformation have brought new development opportunities and challenges. This paper aims to enhance individual learning to rapidly internalize various new experiences and acquire new competencies, and to effectively apply them in practice to help organizations develop and progress. In seeking to improve job task performance, this paper further argues that enhanced learning could transmit the influence of digital transformation to other relevant job outcome variables such as innovative performance and adaptive performance. On the one hand, adaptive performance refers to an individual's high adaptability to job changes and macro VUCA environment brought about by digital transformation, including tolerance and rapid adaptation to ambiguous, complex, uncertain, volatile and unpredictable environment. It indicates an individual could have the right balance of flexibility and resilience to changes. On the other hand, innovative performance refers to an individual's continuous innovation brought about by cross-border thinking, meaning that individuals can retain curiosity, take the initiative to expand their knowledge, and acquire knowledge and contacts across industries, regions, professions, and cultures with an inclusive mindset. At the same time, innovative individuals are also good at making efficient use of huge, fragmented, rapidly iterating and mixed information, rather than being overwhelmed by it. They also proactively use self-media or various nascent information processing tools and communication platforms/channels to join the information network. Based on the above discussion, this paper proposes:

Hypothesis 2a: Individual learning mediates the relationship between digital transformation and job performance.

Hypothesis 2b: Individual learning mediates the relationship between digital transformation and adaptive performance.

Hypothesis 2c: Individual learning mediates the relationship between digital transformation and innovative performance.

3 Method

3.1 Samples and Procedures

The study adopts paid sample services of Credamo (<https://www.credamo.com>) to collect data. All participants were from China. When the platform issued a survey invitation to the participants, they were informed that they would receive a reward of RMB

15 for valid answer. The data collection was voluntary, anonymous, and the answers were only available to the researchers.

In order to minimize the effect of common method variance [11], a two-wave study was designed. In Wave 1, 500 participants filled in the survey, and evaluated their perceived level of digital transformation, learning, and demographic information (i.e., gender, age, educational level, position level). In Wave 2, one month later, all the 500 participants rated their job performance, adaptive performance and innovative performance. After data cleaning, we obtained a final sample of 433 participants. The valid answer rate was 86.6%.

3.2 Measures

We adopted the standard translation and back-translation procedures to create measurements in Chinese. All measures were rated on a seven-point Likert scale (1 = strongly disagree, to 7 = strongly agree).

Digital transformation. In Wave 1, we used Eller and colleagues' [12] three-item scale to measure a participant's perceived level of digital transformation of their organization. A sample item was "Do you think your company has achieved a degree of digitization in the workflow of departments such as research and development (R&D), production, sales, and service?" ($\alpha = 0.89$).

Individual learning. In Wave 1, we used the six-item new knowledge acquisition scale [13,14] to measure learning. A sample item was "During digital transformation, I collect information through informal means (e.g., lunch or social gatherings with customers and suppliers, trade partners and other stakeholders)" ($\alpha = 0.75$).

Job performance. In Wave 2, Becker and colleagues' [15] six-item scale was used. A sample item was "Overall, my job performance is satisfactory" ($\alpha = 0.75$).

Adaptive performance. In Wave 2, Griffin and colleagues' [16] nine-item scale was used. A sample item was "I am able to respond well to the changes required to complete the work" ($\alpha = 0.80$).

Innovative performance. In Wave 2, Scott and Bruce's [17] three-item scale was utilized. A sample item was "I always come up with innovative ideas that are useful to the company" ($\alpha = 0.70$).

Control variable. Individuals' gender, age, educational level and positional level was controlled to rule out their potential influence on the hypothesized relationships.

4 Results

4.1 Preliminary Analyses

Table 1 reports the descriptive analyses and correlations of focal variables. As Table 1 presents, the bivariate correlations between digital transformation and learning ($r = 0.43$, $p < 0.001$) was significant and positive, providing preliminary support for our Hypothesis 1.

Table 1. Means, standard deviations, correlations, and reliabilities.

Variables	Mean	SD	1	2	3	4	5	6	7	8
1. Gender	1.57	.50	--							
2. Age	1.70	.68	-.08	--						
3. Educational level	3.85	.75	.04	-.20***	--					
4. Position level	2.02	.91	-.13**	.15**	.09	--				
5. Digital transformation	4.97	1.11	.03	-.04	.17***	.14**	--			
6. Learning	5.62	.69	-.06	.03	.13**	.18***	.43***	--		
7. Job performance	5.98	.51	-.01	.12*	.02	.09	.39***	.55***	--	
8. Adaptive performance	5.96	.50	-.04	.08	.03	.15**	.46***	.65***	.80***	--
9. Innovative performance	5.59	.76	-.08	-.03	.06	.16**	.55***	.59***	.57***	.66**

Notes. N = 433. SD = standard deviation. For gender, male = 1, female = 2; For age, 21-30 years old = 1, 31-40 years old = 2, 41-50 years old = 3, 51-60 years old = 4, and above 60 years old = 5; For educational level, junior high school = 1, high school/secondary technical school/vocational high school = 2, junior college = 3, undergraduate = 4, master = 5, doctor = 6; For position level, frontline-level employees = 1, frontline-level managers = 2, middle-level managers = 3, and high-level managers = 4.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

4.2 Hypothesis Tests

We adopted SPSS to test our hypotheses. Table 2 presented the results.

After controlling the control variables, the results indicate that digital transformation level is positively associated with learning ($B = .25$, $SE = .03$, $p < .001$), thus, Hypothesis 1 is supported.

Further, we adopted Model 4 in SPSS Macro [18] to construe the 95% bias-corrected confidence intervals [CIs] for estimating indirect effects based on bootstrap-based statistics. Drawing on 5,000 resamples, the results show that the indirect effect between digital transformation and job performance via learning is 0.09 ($SE = 0.02$, 95% $CI = [0.06, 0.12]$, excluding zero). Thus, Hypothesis 2a receives support. Meanwhile, the results show that the indirect effect between digital transformation and adaptive performance via learning is 0.10 ($SE = 0.02$, 95% $CI = [0.07, 0.14]$, excluding zero). Thus, Hypothesis 2b is supported. The results show that the indirect effect between digital transformation and innovative performance via learning is 0.12 ($SE = 0.02$, 95% $CI = [0.08, 0.16]$, excluding zero). Thus, Hypothesis 2c receives support.

Table 2. Regression results.

Variables	Learning		Job performance		Adaptive performance		Innovative performance	
	B	SE	B	SE	B	SE	B	SE
Intercept	4.06***	.24	3.54***	.21	3.29***	.18	2.15***	.28
Gender	-.09	.06	.02	.04	.00	.04	-.10	.06
Age	.04	.05	.08**	.03	.04	.03	-.07	.04

Educational level	.06	.04	-.03	.03	-.05*	.02	-.08*	.04
Position level	.08*	.03	-.02	.02	.01	.02	.03	.03
Digital transformation	.25***	.03	.09***	.02	.11***	.02	.25***	.03
Learning			.35***	.03	.40***	.03	.48***	.04
R ²	.21		.35		.47		.47	

Notes. N = 433. Unstandardized coefficient estimates are reported. SE stands for standard errors. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

5 Discussion

Drawing from empirical results of 433 Chinese employees survey data, this paper verifies that digital transformation promotes individual learning, which in turn, enhances their job performance, adaptive performance and innovative performance.

This study contributes to the development of research in the field of digital transformation as follows: Firstly, based on the macro context of digital transformation, important work outcome variables are explored to highlight the changes that should be strived for or given more attention. Secondly, from China's national conditions and organizational management practices, we focus on solving the outstanding problems of learning and adaptability of individuals in the process of China's digital transformation, alleviating the main contradiction of the lack of digital literacy. In fact, compared to other countries, organizations in China face unique advantages and challenges in undertaking digital transformation. On one hand, China leads the world in the construction of new generation digital technology and commercial infrastructure. The digital economy is rapidly growing, with a large scale, continuously optimizing industrial structure, and continuously advancing industrial digitization, with huge potential. On the other hand, the lack of labor force with high digital literacy also severely restricts the progress of digital transformation in China. Therefore, the establishment of a learning organization and the enhancement of individual digital professional quality through the improvement of learning ability is an important way to solve the problem in the digital era, and also provides a more economical, training cost saving approach for the organization to implement digital transformation.

6 Conclusion

Since low digital literacy becomes obstacle under the premise of digital transformation in nowadays China, this study believes that it is of great significance to seek ideas to promote digital transformation from a learning perspective. Therefore, this paper provides continuous and inexhaustible power for individuals to adapt to the opportunities and challenges brought by digital transformation by enhancing their learning ability. We believe by improving individual's learning level and achieving higher performance

levels, can help individuals regain their core competitiveness and gain sustainable forward momentum for career advancement and personal development.

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References

1. Warner, K. S., & Wäger, M. (2019). Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. *Long Range Planning*, *52*(3), 326-349.
2. Wessel, L., Baiyere, A., Ologeanu-Taddei, R., Cha, J., & Blegind-Jensen, T. (2021). Unpacking the difference between digital transformation and IT-enabled organizational transformation. *Journal of the Association for Information Systems*, *22*(1), 102-129.
3. Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, *122*, 889-901.
4. Nadkarni, S., & Prügl, R. (2021). Digital transformation: a review, synthesis and opportunities for future research. *Management Review Quarterly*, *71*, 233-341.
5. Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, *28*(2), 118-144.
6. Wang, B., Liu, Y., & Parker, S. K. (2020). How does the use of information communication technology affect individuals? A work design perspective. *Academy of Management Annals*, *14*(2), 695-725.
7. Chen, G., Zhou, Q., & Liu, W. (2017). Organizational learning from experience: Current status in multilevel perspective, integration model and future direction. *Nankai Business Review International*, *8*(2), 122-157.
8. KC, D., Staats, B. R., & Gino, F. (2013). Learning from my success and from others' failure: Evidence from minimally invasive cardiac surgery. *Management Science*, *59*(11), 2435-2449.
9. Cannon, M. D., & Edmondson, A. C. (2005). Failing to learn and learning to fail (intelligently): How great organizations put failure to work to innovate and improve. *Long range planning*, *38*(3), 299-319.
10. Zollo, M. (2009). Superstitious learning with rare strategic decisions: Theory and evidence from corporate acquisitions. *Organization Science*, *20*(5), 894-908.
11. Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual review of psychology*, *63*, 539-569.
12. Eller, R., Alford, P., Kallmünzer, A., & Peters, M. (2020). Antecedents, consequences, and challenges of small and medium-sized enterprise digitalization. *Journal of Business Research*, *112*, 119-127.
13. Fernhaber, S. A., & Patel, P. C. (2012). How do young firms manage product portfolio complexity? The role of absorptive capacity and ambidexterity. *Strategic Management Journal*, *33*(13), 1516-1539.
14. Jansen, J. J., Vera, D., & Crossan, M. (2009). Strategic leadership for exploration and exploitation: The moderating role of environmental dynamism. *The Leadership Quarterly*, *20*(1), 5-18.

15. Becker, T. E., Billings, R. S., Eveleth, D. M., & Gilbert, N. L. (1996). Foci and bases of employee commitment: Implications for job performance. *Academy of management journal*, 39(2), 464-482.
16. Griffin, M. A., Neal, A., & Parker, S. K. (2007). A new model of work role performance: Positive behavior in uncertain and interdependent contexts. *Academy of management journal*, 50(2), 327-347.
17. Scott, S. G., & Bruce, R. A. (1994). Determinants of innovative behavior: A path model of individual innovation in the workplace. *Academy of Management Journal*, 37(3), 580-607.
18. Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior research methods, instruments, & computers*, 36, 717-731.

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