

Original Research Article

Research on the impact of employee performance in China's automotive and aircraft manufacturing industry under digital transformation

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Abstract: Against the background of Industry 4.0 and China's digital development strategy, digital transformation has become a core path for the upgrading of China's high-end manufacturing sector, represented by automotive and aircraft production. Different from most quantitative empirical studies using questionnaires and statistical tools, this paper adopts a non-empirical qualitative research paradigm. Based on classical theories of transformational leadership, innovative work behavior, employee performance and digital literacy, this study constructs a theoretical framework with digital literacy as the moderating variable, and verifies the logical relationships among variables through typical cases of Great Wall Motor and Shenyang aviation manufacturing enterprises. The results show that transformational leadership positively promotes employees' innovative work behavior, which further improves employee performance; digital literacy plays a significant negative moderating role between innovative work behavior and employee performance in the context of traditional manufacturing. This study provides targeted theoretical references for manufacturing enterprises to optimize management and stimulate employee vitality in digital transformation.

Keywords: digital transformation; transformational leadership; innovative work behavior; employee performance; digital literacy

1. Introduction

The widespread application of digital technologies such as artificial intelligence, big data and the Internet of Things has pushed global manufacturing into a new stage of digital and intelligent upgrading. For China's manufacturing sector, digital transformation is a key measure to achieve high-quality development and build a world-class manufacturing power^[1]. As typical technology-intensive industries, automotive and aircraft manufacturing are at the forefront of digital transformation, with leading enterprises continuously increasing investment in intelligent production lines and digital management systems.

However, the effect of digital transformation is not only determined by technical equipment, but also closely related to employees' adaptability and work performance. Existing studies mostly use quantitative empirical methods to explore the influencing factors of employee performance, but lack in-depth theoretical deduction and industry-specific case analysis from a qualitative perspective. To fill this research gap, this paper abandons the empirical analysis path of questionnaire survey and SPSS statistical test, and adopts a non-empirical qualitative research method to explore the influence mechanism of transformational leadership, innovative work behavior and digital literacy on employee performance in the context of digital transformation.

This study enriches theoretical research on employee performance in manufacturing digital transformation from a qualitative perspective, and also provides practical ideas for enterprises to optimize leadership styles, improve employees' digital literacy and stimulate innovation vitality.

2. Literature review and research propositions

2.1. Core concepts and theoretical background

2.1.1. Transformational leadership

First proposed by Burns and further developed by Bass, transformational leadership refers to a leadership

style that motivates followers to pursue higher goals by shaping a shared vision, stimulating creative thinking and paying attention to individual growth^[2-3]. It includes four core dimensions: Idealized influence, inspirational motivation, intellectual stimulation and individualized consideration^[4]. In the process of organizational change, transformational leadership can effectively reduce employees' resistance to reform and stimulate their internal work motivation.

2.1.2. Innovative work behavior

Innovative Work Behavior (IWB) refers to employees' proactive behavior of identifying work problems, generating new ideas, promoting and implementing solutions in daily work. Different from pure creative thinking, IWB focuses on the practical application of ideas, covering four interrelated stages: Problem recognition, idea generation, idea promotion and idea realization^[5]. It is widely recognized as a key factor to improve organizational innovation capacity and operational efficiency.

2.1.3. Employee performance

Employee performance refers to the work outcomes and behavioral performance demonstrated by employees in an organization, covering multiple dimensions. According to Griffin et al. (2007), it can be divided into task performance, contextual performance, adaptive performance and counterproductive work behavior^[6]. Among them, task performance and contextual performance are the core dimensions to measure employee work effectiveness. In the digital era, the connotation of employee performance continues to expand, and adaptive ability and innovation competence have become important evaluation components.

2.1.4. Digital literacy

Digital literacy refers to individuals' ability to obtain, evaluate, process and communicate information using digital tools and network platforms^[7]. For enterprises, employees' digital literacy directly determines the application efficiency of digital technology in daily work. From the Technology-Organization-Environment (TOE) framework, digital literacy can promote employee performance from three levels: Technical application, organizational collaboration and environmental adaptation. At present, uneven digital literacy among employees has become an important bottleneck restricting the digital transformation of traditional manufacturing.

2.2. Research propositions

2.2.1. Transformational leadership and innovative work behavior

Transformational leadership can stimulate employees' innovative work behavior through multiple paths. First, idealized influence and inspirational motivation enhance employees' recognition of organizational development goals and stimulate their internal motivation for innovation^[8]. Second, intellectual stimulation creates an open and inclusive organizational atmosphere, encouraging employees to challenge traditional working modes and put forward new ideas. Third, individualized consideration provides targeted growth support for employees with different foundations, helping them gradually improve their innovation ability. Therefore:

Proposition 1: Transformational leadership has a significant positive impact on employees' innovative work behavior.

2.2.2. Innovative work behavior and employee performance

Innovative work behavior can effectively improve employee performance. On the one hand, the generation and implementation of innovative ideas can optimize work processes, solve practical problems and directly improve task performance^[9]. On the other hand, in the process of promoting innovation, employees need to communicate and cooperate with colleagues and managers, which helps to improve contextual performance and team atmosphere. Relevant studies have also confirmed that creative thinking and innovative behavior are positively correlated with individual task performance. Therefore:

Proposition 2: Innovative work behavior has a significant positive impact on employee performance.

2.2.3. Digital literacy as a moderator

The relationship between innovative work behavior and employee performance is affected by contextual factors such as digital literacy. For traditional manufacturing industries that rely heavily on practical experience and on-site operation, when employees' digital literacy is generally low, employees with strong innovative willingness rely more on work experience and sense of responsibility to create performance value, and the positive effect of innovative behavior is particularly prominent. With the

popularization of basic digital literacy, digital tools have become a universal performance booster, and the marginal contribution of individual innovative behavior will be relatively weakened^[10]. Therefore:

Proposition 3: Digital literacy negatively moderates the positive relationship between innovative work behavior and employee performance.

3. Research methodology

This study adopts a non-empirical qualitative research design. It does not collect first-hand questionnaire data or use statistical tools such as SPSS for hypothesis testing, but carries out theoretical deduction and case analysis based on existing academic literature, public industry data and enterprise cases.

3.1. Literature research method

Literature research is the basic method of this study. By sorting out classical theories and the latest research on transformational leadership, innovative work behavior, employee performance and digital literacy at home and abroad, this study systematically grasps the connotation of core concepts and the logical relationship between variables, which lays a solid theoretical foundation for the construction of the analysis framework. The literature sources include authoritative international academic journals, classic management monographs and official industry research reports.

3.2. Case study method

In order to verify the theoretical logic and enhance the practical pertinence of the research, this study adopts the case study method, selecting typical enterprises from automotive and aircraft manufacturing industries respectively. Great Wall Motor is selected as the automobile manufacturing case, which is a representative independent brand enterprise in China and has typical characteristics in digital transformation investment and organizational management innovation. Shenyang aviation manufacturing enterprises are selected as the aircraft manufacturing case, which have a profound industrial foundation and represent the development status of China's aviation intelligent manufacturing.

All case data come from public and authoritative channels, including enterprise annual reports, industry white papers, published case studies and official media reports, ensuring the authenticity and reliability of the case analysis.

4. Analysis and discussion

4.1. Current situation of digital transformation in the industry

In recent years, under the guidance of national strategies such as "Made in China 2025", China's automotive and aircraft manufacturing industries have accelerated the pace of digital transformation. In the automotive industry, represented by Great Wall Motor, enterprises have increased investment in digital R&D and intelligent manufacturing, and promoted the digital upgrading of the whole industrial chain from R&D and design, production and manufacturing to marketing and after-sales. In the aviation manufacturing industry, represented by Shenyang enterprises, digital technologies such as digital twin and virtual simulation have been widely used in production links, which has significantly improved production accuracy and operation efficiency.

However, the digital transformation of the industry also faces common practical problems: Employees' digital ability lags behind the upgrading pace of technical equipment, the traditional hierarchical management mode is difficult to adapt to the requirements of digital operation, and there is a disconnect between digital hardware investment and actual performance improvement. These problems all highlight the important position of employee factors in the process of digital transformation.

4.2. Mechanism analysis of core variables

Combined with the industry characteristics of traditional manufacturing, the internal action mechanism of each variable is further analyzed.

First, transformational leadership can break the conservative working atmosphere of traditional manufacturing workshops. Through personal demonstration and vision guidance, leaders can drive front-line employees to change their work concepts, actively put forward process improvement suggestions, and

stimulate widespread innovative work behavior.

Second, innovative work behavior directly improves work performance by optimizing operation processes, reducing error rates and improving production efficiency. At the same time, in the process of exploring and implementing innovation, employees' own problem-solving ability and professional level are also improved, forming a virtuous circle of ability growth and performance improvement.

Third, the negative moderating effect of digital literacy is closely related to the industry attributes of traditional manufacturing. At present, many front-line production posts still rely on manual operation experience, and digital tools mostly play an auxiliary role. The universal popularization of basic digital literacy will narrow the performance gap caused by individual innovation willingness, thus showing a relative weakening effect.

4.3. Case verification

The practical development of Great Wall Motor verifies the above logical relationship. In the process of promoting new energy transformation and digital upgrading in recent years, the company's management has shown obvious transformational leadership characteristics, put forward a clear development vision, and established a front-line employee innovation incentive mechanism. Driven by this, employees' innovative vitality has been continuously released, and process improvement and technological innovation achievements have emerged one after another, effectively supporting the improvement of enterprise operation performance. At the same time, with the popularization of digital production management systems, the basic work efficiency of all employees has been improved, and the performance gap brought by individual innovative behavior has been relatively reduced.

In Shenyang's aviation manufacturing enterprises, with the continuous advancement of digital transformation, grass-roots managers are guided to adopt a transformational leadership style to drive team members to adapt to new digital technologies and put forward process optimization suggestions combined with actual work. Employees' innovative work behavior has increased significantly, which has become an important support for improving production efficiency and product quality. This practice also confirms the positive promotion relationship between transformational leadership, innovative work behavior and employee performance.

4.4. Key research findings

Through theoretical deduction and case analysis, this study draws three core conclusions. First, transformational leadership is an important driving force to stimulate employees' innovative work behavior in the digital transformation of manufacturing enterprises. Second, innovative work behavior can significantly improve employees' task performance and contextual performance, and is an effective way to promote employee performance growth. Third, digital literacy plays a significant negative moderating role between innovative work behavior and employee performance in the current development stage of China's traditional manufacturing industry.

5. Conclusion

5.1. Research implications

5.1.1. Theoretical implications

This study constructs a complete theoretical analysis framework of "transformational leadership - innovative work behavior - employee performance" with digital literacy as the moderating variable from a non-empirical qualitative perspective, which enriches the research perspectives and theoretical connotations in related fields. The conclusion of the negative moderating effect of digital literacy expands the research on the boundary conditions between innovative work behavior and performance, and provides a new perspective for understanding the role of digital literacy in traditional manufacturing scenarios.

5.1.2. Practical implications

For China's automotive and aircraft manufacturing enterprises, first, they should pay attention to cultivating transformational leadership, and improve managers' ability to stimulate innovation and lead change through targeted training. Second, enterprises should improve the innovation incentive mechanism, unblock the channels for employees to put forward improvement suggestions, and encourage front-line

employees to carry out post innovation. Third, we should promote the improvement of employees' digital literacy step by step in combination with post characteristics, and pay attention to the combination of digital tools and practical production experience. Fourth, we should optimize the organizational support system to help employees turn innovative ideas into practical work results.

5.2. Limitations and future research

This study has certain limitations. As a qualitative non-empirical study, the conclusions are mainly derived from theoretical deduction and typical case analysis, and have not been verified by large sample quantitative data; the coverage of case enterprises is relatively limited. In the future, mixed research methods combining qualitative and quantitative can be adopted to verify the research conclusions with empirical data; more industry samples and enterprise cases can also be expanded to improve the universality of the research conclusions.

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