Research on the Influence of Differential Transformational Leadership on the Dual Innovation of Small and Medium-sized Industrial Enterprises

Su Boyu*, Wang Shimeng and Li Qianqian

1 School of Management Engineering, School of Zhengzhou University, Henan, Zhengzhou, 450000, P.R. China

* SU Boyu’s e-mail: 397236605@qq.com

Abstract. Based on two different levels of transformational leadership, this paper analyzes in detail the impact of differentiated and transformational leaders on dualistic innovation through different agencies in small and medium-sized industrial enterprises. The results of this study show that: In small and medium-sized industrial enterprises, differentiated transformational leaders will have a positive effect on dual innovation. Among them, team effectiveness plays an intermediary role between consistent transformational leadership and dualistic innovation, and breakthrough innovation has greater impact on incremental innovation. Mental empowerment plays an intermediary role in the consistency of transformational leadership and breakthrough innovation. Therefore, we suggest that managers of small and medium-sized industrial enterprises should adjust their own management style according to their innovation goals, and promote the creation of dual innovation through the promotion of their psychological empowerment or team effectiveness.

1. Introduction

With the acceleration of technology renewal, competition in the industry has become increasingly fierce. Compared to large companies, small and medium-sized industrial enterprises face greater technological innovation challenges. Small and medium-sized industrial enterprises managers have to pay attention to the impact of leadership style on technological innovation. Studies have shown that transformational leadership has a greater impact on corporate technology innovation. However, there are still deficiencies in the research on the impact of different transformational leaders on different technological innovations. The concepts of transformational leadership and technological innovation mostly remain at the overall level [1]. It is also very important for small and medium-sized industrial enterprises managers research. Small and medium-sized industrial enterprises are the main force for innovation and development [2]. This paper divides the transformational leadership into consistent transformational leadership and differential transformational leadership. At the same time, according to the degree of technological innovation, the innovation is divided into breakthrough innovation and incremental innovation. This paper attempts to enrich the interaction between transformational leadership and technological innovation in small and medium-sized industrial enterprises.
2. Theoretical review and research hypothesis

2.1. Differentiated Transformational Leadership
Once the transformational leadership was proposed, it was widely concerned by scholars. Transformational leadership refers to the value of a leader in making subordinates aware of their responsibilities and inspiring them to establish a higher level of demand and mutual trust, and to promote their achievement of higher-than-expected organizational benefits [3]. Schriesheim [4] proposes to divide transformational leadership into two dimensions through research: consensus transformation leadership and differential transformation leadership. Consistent transformational leadership is based on the theory of average leadership style. Differential transformational leadership is based on situational leadership theory. The role of managers is to focus on individual members rather than the team as a whole[5].

2.2. Consistent transformational leadership, team effectiveness and dual innovation
Conformance Transformational leaders focus on the indifference of team members, emphasizing idealized impacts and visionary incentives [6]. Idealized influence means that leaders set a good example, enabling employees to achieve consistent thoughts and behaviors through observation and learning, thereby improving mutual understanding and trust [7]. Vision encouragement is that the leader in the daily exchange, draw a clear vision to motivate employees, so that subordinates clearly understand the goals and direction of the team's efforts. Team effectiveness represents the belief that team members believe that their team can achieve success. The mutual trust between team members and the close cooperation between them are closely related to each other, which is the collective ability of team members to perceive. This paper put forward the following hypothesis:

Hypothesis 1: Consistent transformational leadership has a positive effect on team effectiveness.

Dual-type innovation includes breakthrough innovation and progressive innovation. Breakthrough innovation has a greater range of innovation and requires employees to break the conventional thinking framework. Consistently transforming leaders overemphasize the unity within the team, which is not conducive to the development of the personality of the members within the team, so it is difficult to stimulate the creativity and imagination of the employees[8]. Thinking and knowledge frameworks are difficult to fundamentally change. Therefore, the following assumption is made:

Hypothesis 2: Team Effectiveness Negative Consistency Transformational Leadership and Breakthrough Innovation.

Progressive innovation is usually a minor improvement or process innovation of existing technologies, such as: extension of product lines, improvement of product production processes, etc[9]. The innovation requires employees to make full use of the knowledge and experience within the existing team in order to improve and adjust current technology levels. Consistent transformational leadership can promote good interpersonal relationships among members of the team and facilitate the sharing of information, thereby integrating the knowledge and experience of the various teams and improving existing technologies. So we make the following assumption:

Hypothesis 3: Team effectiveness is moving toward consistency Consistency Transformational leadership and incremental innovation.

2.3. Differential Transformational Leadership, Psychological Empowerment and Dual Innovation
Differentiated transformational leaders influence employees through intellectual stimulation and personalized care. Inspiring intelligence means that managers encourage employees to use their imagination and creativity to enhance their work autonomy[10]. Because the psychological authorization is an active psychological state experienced by employees, the differentiated transformational leadership can enhance the psychological empowerment experience of employees. From this we propose the following assumption:

Hypothesis 4: Differential transformational leadership has a positive impact on mental empowerment.

Differentiated transformational leaders can inspire individual subjective innovation spirit, and urge
employees to boldly break through the traditional thinking framework. At the same time, the personalized care of differentiated and transformational leaders is conducive to fully tapping the advantages of employees, focusing on their personal development and encouraging employees to express their opinions, so that employees can freely use their imagination without causing any worries[11]. So the authorized employees can obtain a certain amount of independent decision-making power at work, and can complete their work according to their own ideas and wishes. The staff's personalized creative thinking is easy to emerge. Therefore, the following assumption is made:

Hypothesis 5: Psychological empowerment positive mediation differential transformational leadership and breakthrough innovation.

In small and medium-sized industrial enterprises, the stronger the diversity of transformational leadership styles, the more employees have unfair feelings, and employees will lack a sense of belonging to the company, resulting in the employees not having a sense of identity and belonging to the entire team. Therefore, it is unfavorable to establish harmonious interpersonal relationships among team members[12]. Progressive innovation requires a good environment for information exchange among employees so as to further deepen and improve on the basis of existing technologies. Therefore, we propose the following assumptions:

Hypothesis 6: Psychological empowerment negative mediators to differentiate transformational leadership and incremental technological innovation.

3. Research methods

3.1. Sample

The data was collected in the form of questionnaires. A total of 371 small and medium-sized industrial enterprises were investigated. There were questionnaires that were found to be invalid in the collected data. After the invalid questionnaires were removed, 312 qualified questionnaires were finally received.

Among the effective samples collected, males accounted for 42.9% and females accounted for 57.1%; ages 18-30 years accounted for 70.2%, 31-40 years accounted for 15.4%, 41-50 years accounted for 10.3%, 51 and above accounted for 4.2%; the proportion of education at or below tertiary education accounted for 35.6%, the proportion of undergraduates accounted for 50%, the proportion of masters accounted for 12.2%, and the proportion of doctors and above accounted for 2.2%; the proportion of enterprises below 100 employees accounted for 26%, 100-200 the proportion of people accounted for 14.4%, 201-300 people accounted for 24.4%, 301-400 accounted for 24.7%, 401 or more accounted for 10.6%; working hours less than 1 year accounted for 30.8%, 1-3 years accounted for 29.2%, 40% accounted for 24%, 10% more than 16%.

3.2. Measuring tools

The scales adopted in this study are from domestic and international scales that are relatively mature and have high reliability and validity. In addition to the control variables, the questionnaire uses the Likert 7-point scale measurement variables, of which is strongly disagree and 7 is very agreeable.

- Transformational leadership based on Bass[3] and podsakoff's scholars, this study designed a differential transformation type measurement scale with 6 items and a consistency transformation type measurement scale with 7 items for measurement.
- Psychological authorization. Psychological authorization refers to the existing more mature scales and uses the 12 questions developed by Spreitzer to measure psychological empowerment.
- Team effectiveness. The construction of the team effectiveness scale in this paper uses the measurement scale in Zhou Mingjian [13]. The scale has been modified include 8 questions.
- Dual innovation. The measurement scale of the dualistic innovation refers to the measurement scale designed by Han Chen et al. [14]. Breakthrough innovation is measured by 5 items, and progressive innovation is measured by 3 items.
- Control variables. With reference to the relevant literature in the past, the gender, age, education level, and working years were selected as control variables.
3.3. Factor analysis and reliability, validity test
The Cronbach's Alpha coefficient of the overall scale designed in this paper is 0.945, which is greater than 0.7, indicating that the overall scale has good reliability; each item's Alpha coefficients were 0.897, 0.926, 0.929, 0.93, 0.915, and 0.928, all higher than the 0.7 standard and indicating that each variable has good internal consistency reliability. Table 1 shows that all fitting indicators are in line with the general research standards, so the model can be considered acceptable.

| Fitting indicator | CMIN/DF | RMSEA | SRMR | GFI | AGFI | IFI | TLI | CFI |
|-------------------|---------|-------|------|-----|------|-----|-----|-----|
| Model results     | 1.373   | 0.035 | 0.043| 0.863| 0.845| 0.969| 0.966| 0.968|

From Table 2, it can be seen that the factor load of each measurement item is greater than 0.6, and the compositional reliability is 0.926, 0.897, 0.931, 0.93, 0.915, 0.928, the average variation of extraction amount were 0.643, 0.594, 0.551, 0.626, 0.783, 0.72, all greater than 0.5, indicating that each variable has good convergence validity.

| Variable              | Factor minimum | Factor maximum | CR  | AVE |
|-----------------------|----------------|----------------|-----|-----|
| Differential transformational leadership | 0.72 | 0.854 | 0.926 | 0.643 |
| Consistent Transformational Leadership | 0.726 | 0.834 | 0.897 | 0.594 |
| Team effectiveness Psychological authorization | 0.694 | 0.789 | 0.931 | 0.551 |
| | 0.717 | 0.824 | 0.93 | 0.626 |
| Breakthrough innovation | 0.874 | 0.902 | 0.915 | 0.783 |
| Progressive innovation | 0.817 | 0.868 | 0.928 | 0.72 |

The critical values of the correlation analysis between variables are all below 0.6, demonstrating that the discriminant validity between variables is good.

3.4. Hypothetical Test
This paper uses SPSS23.00 to process the data. It can be seen from Table 3 that after adding the control variable, consistency change has a significant positive effect on team effectiveness (M2, β=0.285, p<0.001). Assuming 1 is established. It can also be seen that the consistency transformation leader has a significant impact on breakthrough innovation (M4, β=0.419, p<0.001), and after joining the team effectiveness, the consistency innovation changes the regression coefficient of the breakthrough innovation from 0.419 to 0.308, and indicating that team effectiveness has a partially positive mediating effect. Assumption 2 does not hold. Consistent change line leader has a significant effect on incremental innovation (M7, β=0.423, p<0.001). After joining the mediator variables of team effectiveness, the consistency change of the incremental innovation regression coefficient decreases from 0.423 to 0.28, and still it has a significant impact. Hypothesis 3 is hold. In comparison, it can be seen that the effectiveness of team effectiveness in consistency changes has a greater role in incremental innovation than breakthrough innovation.
Table 3 Team Effectiveness in Consistency Transformational Leadership of the Dual Innovation Agent

| Team effectiveness | Breakthrough innovation | Progressive innovation |
|-------------------|-------------------------|------------------------|
|                   | M1          | M2          | M3          | M4          | M5          | M6          | M7          | M8          |
| Consistent         | 0.285***    | 0.419***    | 0.308***    | 0.423***    | 0.28***     |             |             |             |
| transformational   |             |             |             |             |             |             |             |             |
| Team effectiveness |             |             |             |             |             |             |             |             |
| R2                | 0.045       | 0.186       | 0.051       | 0.196       | 0.255       | 0.05        | 0.224       | 0.337       |
| Adjusted R2       | 0.032       | 0.173       | 0.038       | 0.183       | 0.241       | 0.038       | 0.211       | 0.324       |
| F                 | 3.588**     | 13.978***   | 4.111**     | 14.925***   | 17.423***   | 4.080**     | 17.67***    | 25.869***   |
| D-W               | 2.156       | 2.016       | 2.162       | 2.052       | 2.092       | 2.160       | 2.107       | 2.118       |

Note: *p<0.05; **p<0.01; ***p<0.001

From Table 4, it can be seen that the differential transformational leader has a significant positive effect on the psychological authorization (M10, β=0.301, p<0.001). Hypothesis 4 is established. The differential transformation leader has a significant impact on breakthrough innovation (M12, β=0.287, p<0.001). After joining the psychological empowerment, the differential change to the breakthrough innovation regression coefficient decreased from 0.287 to 0.134, and still has significant influence. Hypothesis 5 is established. It can also be obtained that mental empowerment does not have a significant impact on incremental innovation, and Hypothesis 6 does not hold.

Table 4 Psychology Authorization in the Conformance Reform Inspection of the Dual Innovation Agent

| Psychological authorization | Breakthrough innovation | Progressive innovation |
|-----------------------------|-------------------------|------------------------|
|                            | M9          | M10         | M11         | M12         | M13         | M14         | M15         | M16         |
| Differential transformation | 0.301***    | 0.287***    | 0.134**     | 0.186**     | 0.163***    |             |             |             |
| Psychological authorization |             |             |             |             |             |             |             |             |
| R2                          | 0.031       | 0.123       | 0.051       | 0.127       | 0.337       | 0.05        | 0.088       | 0.094       |
| Adjusted R2                 | 0.018       | 0.108       | 0.038       | 0.133       | 0.324       | 0.038       | 0.073       | 0.076       |
| F                            | 2.456       | 8.561***    | 4.111***    | 8.933***    | 25.847***   | 4.080**     | 5.927***    | 5.285***    |
| D-W                          | 2.037       | 1.986       | 2.162       | 2.144       | 2.138       | 2.160       | 2.156       | 2.155       |

Note: *p<0.05; **p<0.01; ***p<0.001

4. Conclusion and Outlook

In recent years, although scholars have conducted relevant research on the relationship between transformational leadership style and innovation, there are still deficiencies. This paper divides transformational leadership into differentiated and transformational leaders, technological innovation is divided into breakthrough innovations and gradual innovations. It also studies the impact of differentiating transformational leaderships on the two innovations. The following three conclusions are drawn from the study: 1. Psychological authorization is an effective intermediary between consistent transformational leadership and Dual Innovation, and it plays a greater role in incremental innovation than breakthrough innovation. 2. Team effectiveness is an effective intermediary between differential transformational leadership and breakthrough innovation, and it positively influences breakthrough innovations, while psychological empowerment is not. 3. In small and medium-sized industrial enterprises, differentiated and transformational leaders have a positive impact on dual innovation but have different effects.

Therefore, we suggest that managers should pay attention to transformational leadership and have
the purpose to adjust their self-leadership style so as to achieve the goal of innovation in different enterprises. In addition, managers should also attach importance to improving employees' mental empowerment and improving team effectiveness. Both have great influence on technological innovation in different aspects.

The direction of future development is: 1. Study the effective mediating role of consistency between transformational leadership and incremental innovation; 2. Verify whether there are other intermediary variables between differentiated transformational leadership and dual innovation; (3) In the future, multilevel models can be used to study leadership styles for team members to enhance the reliability of the research conclusions.

References

[1] Avolio, B. J., Bass, B. M. & Jung, D. I, 1999, Reexamining the Components of Transformational and Transactional Leadership Using the Multifactor Leadership Questionnaire, Journal of Occupational and Organizational Psychology, 72: 441-462.

[2] Cai Yahua, Jia Liangding, You Shuyang, et al. Influence of Differentiated Transformational Leadership on Knowledge Sharing and Team Creativity: Explanation of Social Network Mechanisms[J]. Chinese Journal of Psychology, 2013, 45(5):585-598

[3] Bass B M, Avolio B J. MLQ Multifactor Leadership Questionnaire[M]. Redwood City: Mind Garden, 1995

[4] Schriesheim C A, Wu J B, Scandura T A. A meso measure? Examination of the levels of analysis of the Multifactor Leadership Questionnaire (MLQ) [J]. The Leadership Quarterly, 2009,20(4):604-616

[5] Wu J B, Tsui A S, Kinicki A J. Consequences of differentiated leadership in groups[J]. Academy of Management Journal, 2010,51(1):90-106.

[6] Grant A . M . Leading with Meaning: Beneficiary Contact , Prosocial Impact , and the Performance Effects of Transformational Leadership [J] . Academy of Management Journal, 2012, 55(2):458－476

[7] Lindsley D H, Brass D J, Thomas J B. Efficacy-performing spirals: A multilevel perspective[J]. Academy of Management Review, 1995, 20(3):645-678.

[8] Zhang Z, Peterson S J. Advice networks in teams: the role of transformational leadership and members’ core self evaluations . Journal of Applied Psychology, 201196(5) :1004-17.

[9] Zhou K Z. Innovation, imitation, and new product performance: the case of China [J]. Industrial Marketing Management, 2006, 35(3):394-402.

[10] Howen J M, Avolio B J Transformational Leadership, Transactional Leadership, Locus of Control, and Suppoa for Innovation : Key Pre—dietors of Consolidated—Business—Unit Performance . Journal of Applied Psychology, 1993, 78(6):891-902

[11] Ding Lin, Xi Yumin, Zhang Hua. Transformational leadership and employee innovation: The intermediary role of leadership-subordinate relations [J]. Research Management, 2010, 31(1); 177-184

[12] You Shuyang, Jia Liangding, Cai Yahua. Differences in Supervisory Sense of Support, Knowledge Sharing, and Creativity—Based on Team-Level Research[J]. Economic Management, 2013(1):70-79.

[13] Spreitzer G. Psychological empowerment in the workplace: Dimensions, measurement,and validation[J].Academy of Management Journal, 1995,38(5):1442-1465.

[14] Zhou Mingjian, Pan Haibo, Ren Jifan. Research on the Relationship between Team Conflict and Team Creativity: The Mediating Effect of Team Effectiveness[J]. Management Review, 2014, 26(12):120-130.

[15] Han Chen, Gao Shanxing. Research on the relationship between market learning, innovation and multidimensional performance of enterprises[J]. Science & Technology Progress and Policy,
2017, 34(7):68-75.