



Research on the Social Network to Bootleg Innovation—Based on the Bootstrap Method

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Abstract. Based on the social cognitive theory, this study analyzes the relationship between social network and bootleg innovation. Using SPSS 22.0 and AMOS 23.0 and the Bootstrap method to analyze the survey data of 234 enterprise employees, the results show that: social network has a positive impact on bootleg innovation, and creative self-efficacy mediates the relationship between social network and bootleg innovation.

Keywords: Social Network · Bootleg Innovation · Creative Self-efficacy · SPSS 22.0 · AMOS 23.0

1 Introduction

Bootleg innovation plays an active role in enterprises' product innovation, knowledge innovation, and experiential learning [1]. Surveys have been conducted to show that bootleg innovation behavior has occurred more frequently in practice, and more than 80% of organizations have experienced bootleg innovation behavior within their organizations [2]. Moreover, employees' bootleg innovation usually leads to revolutionary new technologies or products, which in turn brings huge innovation benefits to the company. Therefore, how to activate the bootleg innovation behavior of employees has gradually become the focus of scholars and business managers.

Scholars have mostly explored the factors influencing bootleg innovation from the perspective of internal resources of enterprises, which can be summarized into three aspects: leadership style (e.g. humble leader [3]), individual traits (e.g. high-preoccupational personality employees [4]), and organizational environment (e.g. organizational innovation climate [5]). However, companies' resources are often limited, and using external knowledge and resources for innovation has become an important trend in corporate innovation. Employee social network are an important way to access external innovation resources, which is extremely important for promoting employees' innovative behaviors [6]. There are few studies on the relationship between employees' social network and bootleg innovation. Therefore, exploring the mechanism of social network influence on bootleg innovation is necessary.

According to the social cognitive theory [7], creative self-efficacy is an important mediating variable that transmits environmental influences to employees' innovative

behavior, which helps to explain the role of social network in influencing employees' behavior. Under the influence of social network, employees' resources are constantly replenished and they do not worry too much about the depletion of their own resources, when their confidence in creatively completing tasks in innovation activities is enhanced [8], and high creative self-efficacy tends to stimulate employees' innovation motivation and behavior. Therefore, to explore the intermediate mechanisms through which social network influence bootleg innovation, this paper will examine how social network indirectly influence employees' bootleg innovation behaviors through the mediating variable of creative self-efficacy. To sum up, this study will explore the mechanism of social network influencing bootleg innovation from the perspective of social cognitive theory, focusing on the issue of "social network inducing bootleg innovation behavior through creative self-efficacy".

2 Theory and Hypotheses

2.1 Social Network and Bootleg Innovation

Bootleg innovation refers to "an innovative behavior that is performed by ignoring the veto of innovation intentions by superiors and insisting on its implementation" [9]. Social network refers to a relatively stable system of associations formed by interactions between people [10]. The social cognitive theory states that there is a dynamic connection between the external environment, the individual, and individual behavior [11]. This study predicts that social network can facilitate employees' implementation of transgressive innovative behaviors, specifically, on the one hand, employees' internal social network is small and dense, and they are an important way to transfer, diffuse, and reconstruct information. The emotional support and high-value information resources that employees obtain from them help to reduce employees' risk expectations of bootleg innovation and generate stronger psychological perceptions such as subjective motivation and self-inflation when employees are not afraid of conflicts and are more inclined to adopt bootleg innovation behaviors for long-term benefits. On the other hand, employees' external social network can become intermediaries for exchanging, borrowing, or acquiring heterogeneous resources from others [12], so that employees are exposed to and have access to a wider variety of information, resources, and opportunities to achieve career development [13], and this informal resource channel can effectively help employees generate incremental amounts of their own resources, and employees tend to invest their own existing resources to cultivate a resource value-added spiral, at which time employees are more likely to make risky investments, i.e., more willing to invest resources in high-return bootleg innovation behaviors. Based on the above analysis, the following research hypotheses are proposed.

Hypothesis 1. The social network has a positive impact on bootleg innovation.

2.2 The Mediating Role of Creative Self-efficacy

Creative self-efficacy refers to the belief that individuals can creatively accomplish tasks at work [14]. According to the Social Cognitive Theory, environmental factors, cognition,

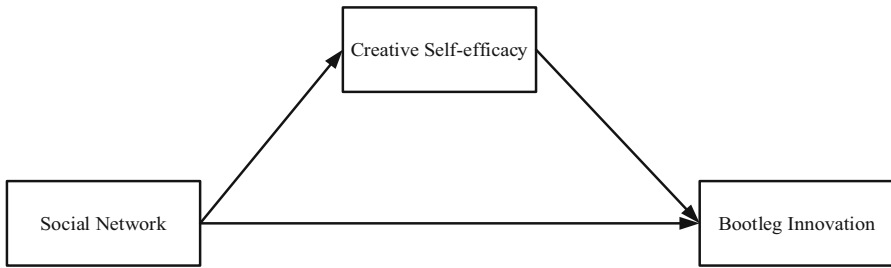


Fig. 1. The conceptual model of the relationship between social network, creative self-efficacy, perceived overqualification, and bootleg innovation.

and individual behavior are interdependent and influence each other [15]. Specifically, individuals are driven by goals and form action plans based on their assessment of themselves and the external environment, and then influence the external environment and strive to achieve their desired goals through self-actualization processes [16]. The present study argues that individual bootleg innovation behavior is influenced by social network that is channeled through creative self-efficacy. The information resources and emotional support employees receive through social network can influence their thinking patterns, behavioral motivations, and physical and mental responses, helping to improve their perceptions of the feasibility of innovation and thus their creative self-efficacy. Employees with high innovative self-efficacy are more confident in their abilities, have a stronger willingness to make innovative changes, and are convinced that completing such challenging tasks is meaningful and will use their greater potential to do their work creatively [17]. When innovative behavior or creative ideas are hindered, employees attribute the problem to a lack of effort rather than a lack of ability [5], which will enhance their motivation for additional input and motivate them to adopt transgressive innovative behavior to prove the value of the task to convince others. Therefore, the following hypotheses is proposed.

Hypothesis 2. Social network have a positive impact on creative self-efficacy

Hypothesis 3. Creative self-efficacy has a positive effect on bootleg innovation

Hypothesis 4. Creative self-efficacy mediates the role between social network and bootleg innovation

The proposed conceptual model is shown in Fig. 1.

3 Method

3.1 Principle

Consider the effect of the independent variable X on the dependent variable Y . If X affects Y through the influence of the variable M , then M is said to be the mediating variable. The following regression equation can be used to describe the relationship between the variables:

$$Y = cX + e_1 \quad (1)$$

$$M = aX + e_2 \quad (2)$$

$$Y = c'X + bM + e_3 \quad (3)$$

The coefficient c of Eq. (1) is the total effect of the independent variable X on the dependent variable Y ; the coefficient a of Eq. (2) is the effect of the independent variable X on the mediating variable M ; the coefficient b of Eq. (3) is the effect of the mediating variable M on the dependent variable Y after controlling for the effect of the independent variable X ; the coefficient c' is the direct effect of the independent variable X on the dependent variable Y after controlling for the effect of the mediating variable M ; e_1 – e_3 are the regression residuals. For such a simple mediation model, the intermediate effect is equal to the indirect effect, i.e., it is equal to the product of the coefficients ab , which is related to the total and direct effects as follows:

$$c = c' + ab \quad (4)$$

3.2 Participants and Procedures

In this study, employees of enterprises who understand bootleg innovation in Jiangsu, Shanghai, and Guangdong provinces and cities were used as research subjects. Pre-research tests were conducted first, and the questionnaire questions were revised and language optimized through pretests to ensure that the questionnaire design had no obvious bias. A total of 234 valid questionnaires were collected in the formal research session. In terms of the demographic variables of the respondents, the proportion of males was 49.15% and the proportion of females was 50.85%; the highest proportion of employees in the age group of 31–40 years old was 32.91%, and the proportion of employees in the age group of 26–30 years old was 32.05%; the highest proportion of employees with 3 years or less working time was 32.05%.

3.3 Measures

The questionnaire of this study was divided into four parts: social network scale, creative self-efficacy scale, bootleg innovation scale, and control variables, and the scales used were all mature scales available at home and abroad. Except for the control variables, all other variables were measured using the Likert 5-point scale. The details of the measurement scales of the study variables are as follows.

- 1) Social network: The scale developed by BarNir & Smith [18] and Dong Baobao [19] was used, with three items. The higher the score, the higher the level of social network. The Cronbach's α value of this scale is 0.768, which indicates high reliability.
- 2) Creative self-efficacy: The scale developed by Tierney & Farmer [14] was used, with four items. The Cronbach's α value of this scale is 0.793, which indicates that the reliability is high.

Table 1. Confirmatory factor analysis

Model	Description	χ^2	<i>df</i>	χ^2/df	CFI	TLI	RMSEA
one-factor	SN + CS + BI	346.44	54	6.416	0.706	0.64	0.152
two-factor	SN + CS, BI	158.525	53	2.991	0.894	0.868	0.092
three-factor	SN, CS, BI	66.749	51	1.309	0.984	0.979	0.036

Note: SN = Social Network, CS = Creative Self-efficacy, PO = Perceived Overqualification, BI = Bootleg Innovation

3) Bootleg innovation: The scale developed by Criscuolo et al. [20] was used, with five items. The scale was self-rated by individuals, and higher scores indicated more transgressive innovative behaviors. The Cronbach's α value of this scale is 0.837, which indicates high reliability.

4). Control variables: Through combing previous literature, variables such as gender, age, years of work, and education level were selected as variables that affect an individual's bootleg innovation to be controlled.

4 Results

4.1 Reliability and Validity Test

In this study, the reliability of each scale was analyzed using SPSS 22.0 software, and the results indicated that the Cronbach's alpha values for the social network, creative self-efficacy, overqualification, and bootleg innovation were all greater than 0.6, indicating that the reliability of the scales was good and could support the next study. Further, a validation factor analysis was conducted using AMOS 23.0 software to examine the discriminant validity of the five variables: social network, creative self-efficacy, overqualification, and bootleg innovation. As shown in Table 1, the three-factor model ($\chi^2 = 66.749$, *df* = 51, $\chi^2/df = 1.309$, RMSEA = 0.036) fit significantly better than the other models, indicating good discriminant validity among the three variables.

This questionnaire controls for common method bias procedurally by taking anonymous measures and other measures. The Harman's one-factor test was conducted, whereby all items were simultaneously entered into a factor analysis through principal components analysis. The results of the factor analysis indicated that a total of four factors with eigenvalues greater than one were extracted without rotation, and the maximum factor variance explained was 33.73%, which was less than 40% and within an acceptable range, so there was not a single factor structure that all items emerged or one factor that accounted for the majority of the total variance.

4.2 Descriptive Analysis and Correlation Analysis

Means, standard deviations, and correlations of variables were performed by using SPSS 22.0 software. As predicted, social network is positively related to creative self-efficacy ($r = 0.470$, $p < 0.01$), and it is positively related to bootleg innovation ($r = 0.381$, $p < 0.01$). And creative self-efficacy is positively related to bootleg innovation ($r = 0.432$, $p < 0.01$), Therefore, the research hypotheses were initially tested.

4.3 Hypothesis Testing

1) The Main Effect of Social Network on Bootleg Innovation

As shown in Table 2, the main effect of social network on bootleg innovation was positive and statistically significant ($\beta = 0.384$, $p < 0.001$, Model 4). This yield support for Hypothesis 1. The Model 2 results in Table 3 support Hypothesis 2, that is, social network is positively and significantly related to creative self-efficacy ($\beta = 0.428$, $p < 0.001$). The Model 5 results in Table 3 support Hypothesis 3, that is, creative self-efficacy is positively and significantly related to bootleg innovation ($\beta = 0.4559$, $p < 0.001$).

2). The Mediating Effect of Creative Self-efficacy between Social Network and Bootleg Innovation

To test the mediation Hypothesis, we estimated the a (effect of social network on creative self-efficacy) and b paths (effect of creative self-efficacy on bootleg innovation in the presence of ethical leadership) as shown in Table 2. Model 6 results in Table 3 show that creative self-efficacy had a significant effect on bootleg innovation ($\beta = 0.351$, $p < 0.001$) and the effect of social network on bootleg innovation decreased compared to Model 4 ($\beta = 0.234$, $p < 0.01$), indicating that creative self-efficacy plays a partially mediating role between social network as well as bootleg innovation, and Hypothesis 4 was verified.

We estimated the indirect, direct, and total effects as well as their 95% confidence intervals (CI) using the Bootstrapping procedure based on PROCESS macro to test the mediation hypothesis, Table 3 shows that the direct effect value of social network on bootleg innovation is 0.234 with a confidence interval of [0.070, 0.406], which does not contain 0, indicating the existence of a direct effect, and Hypothesis 1 is further tested. In the indirect path, the indirect effect value is 0.151 with a 95% confidence interval

Table 2. Results of mediating hypotheses

Variables	Creative self-efficacy		Bootleg Innovation			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Control variables						
Gender	0.102	0.050	0.008	-0.038	-0.039	-0.056
Age	0.044	0.008	-0.012	-0.044	-0.032	-0.047
Education	0.152*	0.095	0.153*	0.102	0.083	0.068
Working seniority	0.045	0.020	0.096	0.073	0.075	0.066
Social network		0.428***		0.384***		0.234**
Creative self-efficacy					0.459***	0.351***
R^2	0.045	0.233	0.037	0.160	0.201	0.237
F	2.686*	13.838***	2.225	8.704***	11.453***	11.768***

Note: *** $P < 0.001$; ** $P < 0.01$; * $P < 0.05$

Table 3. Indirect effect of mediation models

	Effect	Boot SE	Boot LLCI	Boot ULCI
Indirect effect	0.1505	0.0431	0.0697	0.2377
Direct effect	0.2337	0.0836	0.0735	0.4035
Total effect	0.3842	0.0738	0.2381	0.5281

[0.072, 0.241], which does not contain 0, indicating a significant indirect effect, and Hypothesis 4 is further tested.

5 Conclusions and Implications

5.1 Conclusions

This study constructs a model of the relationship between social network, creative self-efficacy, overqualification, and bootleg innovation based on social cognitive theory and conducts empirical tests. The findings show that: social network has a significant positive impact on bootleg innovation; creative self-efficacy plays a partially mediating role between social network and bootleg innovation.

5.2 Practical Implications

1) Managers should pay attention to the positive role of employees' social networks, and systematically build and strengthen them. Specifically, managers should increase communication opportunities between employees and colleagues within the company and among external counterparts, provide employees with a platform to obtain a large amount of heterogeneous information and pay attention to the development of employee trust relationships, and encourage employees to actively enrich their own resources through social networks and carry out bootleg innovation.

2) Creative self-efficacy is a kind of psychological state of employees, and managers should use its psychological changes to adjust employees' bootleg innovation behaviors. Managers should help employees cultivate and enhance their sense of creative self-efficacy, motivate them to devote themselves to creative activities, and then stimulate them to show more transgressive innovative behaviors.

5.3 Limitations and Directions for Future Research

First, although this study took certain measures to avoid common method bias and the statistical test results showed no serious common method bias, future research could consider broadening the channels of data measurement. Second, this paper explored the mechanism of the relationship between social networks and guided innovation based on social cognitive theory, and future research could examine this issue from other perspectives and study the formation mechanism of transgressive innovation in depth.

References

1. Hongyu W, Zhisong C, Chunlong Z, et al. (2019) Loyal or rebel? Employee bootleg innovation in Chinese context. *Advances in Psychological Science*, 27:975-989.
2. Augsdorfer P. (2005) Bootlegging and path dependency. *Research Policy*, 2005,34:1-11.
3. Yuming W, Chen P, Yinzheng Z. The effect of humble leadership on creative deviance——Chain mediating effect of supervisor-subordinate guanxi and psychological entitlement. *Soft Science*, 34:140-144.
4. Jianzhao Y, Xiaodi L. (2019) Research on the proactive personality to the performance of deviant innovation——The mediation of innovation catalysis and the moderation of transformational leadership behavior. *Forecasting*, 38:17-23.
5. Hongyu W, Jiali Y. (2019) The effect of organizational creative climate on creative deviant behavior. *Soft Science*, 33:126-129.
6. Qinghong Y, Lin C, Zongxiao X, et al. (2017) Knowledge staff's social network tie strength and innovation behavior: Perspective of need satisfaction for relatedness and risk aversion. *Forecasting*, 36:24-29.
7. Bandura A. (2001) Social cognitive theory: An agentic perspective. *Annual Review of Psychology*, 52:1-26.
8. Yan Y, Bei H. (2011) Research on relationship between social network, entrepreneur self-efficacy and entrepreneurial intention. *Soft Science*, 25:59-63.
9. Mainemelis C. (2010) Stealing fire: Creative deviance in the evolution of new ideas[J]. *The Academy of Management Review*, 2010,35:558-578.
10. Marilyn E. Gist, Mitchell T R. (1992) Self-efficacy: A theoretical analysis of its determinants and malleability[J]. *The Academy of Management Review*, 1992,17:183-211.
11. Bandura A. (1986) *Social foundations of thought and action: A cognitive social theory*[M]. Prentice Hall, New York.
12. Lin N. (1999) Social networks and status attainment[J]. *Annual Review of Sociology*, 1999, 25:467-487.
13. Meng C, Haifeng D. (2020) Impact on employees' accumulated social capital on individual performance in enterprise. *Journal of Management Science*, 33:75-87.
14. Tierney P, Farmer S M. (2002) Creative self-efficacy: Its potential antecedents and relationship to creative performance[J]. *The Academy of Management Journal*, 2002,45:1137-1148.
15. Stajkovic A D, Luthans F. (1998) Self-efficacy and work-related performance: A meta-analysis [J]. *Psychological Bulletin*, 1998,124:240-261.
16. Xiao L, Yun F, Guimei M, et al.(2020) The relationship between intrinsic career goals and idiosyncratic deals and the effect on individual innovation behavior——Based on social cognitive theory. *Management Review*, 32:203-214.
17. Zhiming X. (2020) "Outside, the monarch's order may not be accepted": Are remote jobs really conducive to employees' deviant innovation behavior? *Foreign Economics & Management*, 42:36-47.
18. BarNir A, Smith K A. (2002) Interfirm alliances in the small business: The role of social networks[J]. *Journal of Small Business Management*, 2002,40:219-232.
19. Baobao D, Xiaoyue Z. (2015) Network orientation, dynamic capability and competitive advantage: An interactive model and its implications. *South China Journal of Economics*:37-53.
20. Criscuolo P, Salter A, Ter Wal A L J. (2014) Going underground: Bootlegging and individual innovative performance[J]. *Organization Science*, 2014,25:1287-1305.

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