

The development of Innovation team leader leadership behavior scale

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Abstract. On the base of connotative definition and theoretical basis, the initial measurement project of develop Innovation team leader leadership behavior scale refer to scales of scholars both at home and abroad, use the combination of quantitative and qualitative methods to select measurement project. The project obtains a scale where evaluation results structural dimensions, reliability and validity are rational, and then develop measuring Innovation team leader leadership behavior scale. It includes innovative task-oriented, personnel relationship-oriented, participating in innovation and toxic/destructive leadership behavior four primary indicators and sticking to the target, target monitoring and so on twenty-five secondary indicators.

1 The initial measurement project of innovation team leader leadership behavior scale

The initial measurement project originates in connotative definition and theoretical basis of innovation team leader leadership behavior. The author holds that Innovation team leader leadership behavior scale needs the doing that can measure circumstance, organization, task, member and a series of factors leaders faced with in the process of leading/instructing innovation team¹. It includes innovative task-oriented leadership behavior(LTA), personnel relationship-oriented leadership behavior(LRE), participating in innovation leadership behavior(LPA) and toxic/destructive leadership

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behavior(LTO) four dimensions.

1.1 Innovation team leader’s innovative task-oriented leadership behavior(LTA)

The measurement project of innovation team leader’s innovative task-oriented leadership behavior(LTA) needs to measure the doings in favor of learning innovative task requires,operating procedures and relevant information. By referring scales of transactional leadership behavior, creating structure and cross-border communication, the author developed the LTA measurement project. Through the revise with members and experts in innovation team, author forms the initial measurement project of Innovation team leader’s LTA, as shown in table 1.

Table 1. The initial measurement project table of Innovation team leader’s LTA

measure indicator	measurement project	encoding
sticking to the target	team leader helps the whole team to focus on goals without deviation	lta1
explaining the target	team leader can clearly explain to the employees task/project goals, responsibilities, etc.	lta2
target monitoring	Team leader can monitor the reaching process of team goals	lta3
Checking schedule	Team leader checks schedule according to the plan, look to whether according with the target	lta4
Planning target systematically	Team leader can plan how to finish task/project from the details	lta5
Target assessment	Team leader formulates strict target assessment system for team	lta6
Correcting members behavior	Team leader can timely find and correct members’ behaviors that have nothing to do with target	lta7
Clarifying work standard	Team leader put forward specific and feasible work standard to team members	lta8
Describing the vision	Team leader will describe the position and meaning of the research direction in the field to team members	lta9
coordination work	Team leader knows how to organize and coordinate work to avoid delay, repetitive work and resources waste	lta10
Clarifying responsibility	Team leader clearly tells us work tasks and responsibilities	lta11
Fighting for resources	Team leader fought lots of resources for us	lta12
Maintaining external relationships	Team leader established a good interactive relationship with external organization	lta13
measure indicator	measurement project	encoding

Praise promptly	Team leader can affirm our work and performance promptly	lta14
Inspiring members	Team leader uses incentives to inspire members to work hard	lta15
Fair evaluation	Team leader makes fair evaluation on members' performance	lta16
system construction	Team leader will tell members the rules and expectations	lta17
Work democracy	Team leader will propose modified methods and suggestions on how to improve team performance	lta18
Controlling schedule	Team leader knows work schedule clearly	lta19

1.2 Innovation team leader's personnel relationship-oriented leadership behavior(LRE)

The measurement project of innovation team leader's personnel relationship-oriented leadership behavior(LRE) needs to measure the doings in favor of behavioral interaction, cognitive structure and working attitude. By referring scales of transformational leadership behavior, understanding and authorization, the author developed the LRE measurement project. Through the revise with members and experts in innovation team, author forms the initial measurement project of Innovation team leader's LRE, as shown in table 2.

Table 2. *The initial measurement project table of Innovation team leader's LRE*

measure indicator	measurement project	encoding
Maintaining membership	Team leader helps to establish a good relationship between team members	lre1
Providing space	Team leader provides members with sufficient free space	lre2
Training staff	Team leader provides members with opportunities for development and displaying talent	lre3
Trusting staff	Team leader gives trust to members' ability of performing difficult tasks	lre4
Interacting with members	When making decisions that have an impact on the members, the team leader is able to talk to their members to learn about their responses and suggestions	lre5
caring about the life of members	Team leader cares about the life of members, then get along with members	lre6
Describing the vision	Team leader describes a good prospect to members	lre7
Encouraging innovation	Team leader often encourages us to try new ways	lre8
measure indicator	measurement project	encoding

creating innovative atmosphere	Team leader often creates an atmosphere good for innovation	lre9
Focusing on emotional communication	Team leader will find time to chat with team members	lre10
Being willing to listen to opinions	Team leader encourage members to express their ideas and suggestions	lre11
Pay attention to members' giving	Team leader focuses on the efforts of team members.	lre12
Close contact	Team leader maintain close contact with members	lre13
Encouraging cooperation	Team leader encourages cooperation among team members.	lre14
Encouraging member development	Team leader gives advice to members,future career development	lre15
Inspiring thinking	Team leader inspires members to analyze problems from different perspectives.	lre16

1.3 Innovation team leader’s participating in innovation leadership behavior(LPA)

The measurement project of innovation team leader’s participating in innovation leadership behavior(LPA) needs to measure the doings in favor of enhancing the self-value and self-efficacy of members, participating in innovation process, team management and learning, giving the staff with good judgment, creativity, attention, influence, support, information and other resources and enhancing motivation level on the intrinsic motivation. By referring participatory leadership behavior scale, the author developed the LPA measurement project. Through the revise with members and experts in innovation team, author forms the initial measurement project of Innovation team leader’s LPA, as shown in table 3.

Table 3. *The initial measurement project table of Innovation team leader’s LPA*

measure indicator	measurement project	encoding
making oneself an example	Team leader sets a good example with his/her performance in the work	lpa1
Leading	Team leader shows high requirements to work performance with his/her own behaviors	lpa2
Taking responsibilities	Team leader is responsible for the work and encourages to take responsibilities	lpa3
measure indicator	measurement project	encoding

Encouraging participation	Team leader encourages members to participate in projects and decision-making	lpa4
Giving opportunities	Team leader always provide the members with sufficient free space	lpa5
Working together to solve problems	Team leader encourages members to work together to solve problems	lpa6
Exchanging information with each other	Team leader encourages members to exchange information with each other	lpa7
Exchanging different opinions	Team leader encourages members to provide different opinions on decision-making	lpa8
Working hard	Team leader works as hard as we do	lpa9
Strong innovation ability	Team leader has high quality and strong innovation ability	lpa10

1.4 Innovation team leader’s toxic/destructive leadership behavior(LTO)

The measurement project of innovation team leader’s toxic/destructive leadership behavior(LTO) needs to measure the unfair and disreputable doings that have been continuously performed by leaders to violate legitimate benefits of organization and members. By referring scales of destructive leadership behavior, differential leadership behavior, toxic leadership behavior and abusive supervision, the author developed the LTO measurement project. Through the revise with members and experts in innovation team, author forms the initial measurement project of Innovation team leader’s LTO, as shown in table 4.

Table 4. *The initial measurement project table of Innovation team leader’s LTO*

measure indicator	measurement project	encoding
Differential leadership	The team leader stresses group and affinities and care for people having close relationship with him/her	lto1
arbitrariness	Team leader makes decisions on his/her own	lto2
partiality	Team leader often shows partiality to members he/she likes	lto3
partial tolerance	Team leader shows leniency to his/her close members	lto4
Partial control	Team leader has less control over close members and let them master core work	lto5
Partial promotion award	members close with team leader will receive more opportunities for salary increase or welfare benefits than the average	lto6
measure indicator	measurement project	encoding

Striking the opponents	Letting the situation worse, team leader uses means to combat the rival of his/her close members	lto7
non-action	Team leader ignores or promotes incompetent members	lto8
Suppressing criticism	Team leaders use threats and dictatorship to suppress criticism	lto9
Making members antagonistic to each other	Team leader makes members antagonistic to each other	lto10

2 Qualitatively developing the measurement project of innovation team leader leadership behavior

In order to carry out a more thorough and detailed analysis of the applicability of the measurement project, the author invites nineteen experts(including three management professors, five associate professors of management, five doctoral candidates of management, three doctoral candidates in economics and thee doctors of engineering) to participate in the further screening of these projects².

These experts independently carry on reading, analyzing and selecting according to their respective working background and research direction, their main works are as the following: (Giving suggestions on the appropriateness and accuracy of the item content, deleting projects that are not highly differentiated(lat4、lre8、lre14、lpa5、lpa7、lpa10), deleting projects that are ambiguous or vague(lta6、lta18、lre4、lre11、lpa2、lto2、lto8), combining projects of similar content into a new project and coding(combining Ita7,Ita14 into Ita20; combining Ita10,Ita11 into Ita21; combining Ita3,Ita15 into Ita17; combining Ita6,Ita10,Ita13 into Ita18; combining Ita7,Ita9 into Ita19; combining Ita1,Ita3,Ita4,Ita5,Ita6 into Ita11) and increasing measurement projects of innovation team features; (Bying repeated communications, giving suggestions on the readability of the questionnaire, straightening out and determining the final statements³. After brainstorming discussion, repeated communications and agreements, ultimately forming a project pool with 32 items, as shown in table 5.

Table 5. *The measurement project pool of innovation team leader leadership behavior*

number	measurement project	coding
1	team leader helps the team to focus on goals without deviation	lta1
2	team leader can clearly explain to the employees task/project goals, responsibilities, etc.	lta2
3	Team leader can monitor the reaching process of team goals	lta3
4	Team leader can plan how to finish task/project from the details	lta5
5	Team leader put forward specific and feasible work standard to team members	lta8
number	measurement project	coding

6	Team leader fought lots of resources for us	lta12
7	Team leader established a good interactive relationship with external organization	lta13
8	Team leader uses incentives to inspire members to work hard	lta15
9	Team leader makes fair evaluation on members' performance	lta16
10	Team leader will tell members the rules and expectations	lta17
11	Team leader knows work schedule clearly	lta19
12	Team leader can timely praise members and correct members' behaviors that have nothing to do with target	lta20
13	Team leader confirm task and responsibility to avoid delay, repetitive work and resources waste	lta21
14	Team leader helps to establish a good relationship between team members	lre1
15	Team leader provides members with sufficient free space	lre2
16	When making decisions that have an impact on the members, the team leader is able to talk to their members to learn about their responses and suggestions	lre5
17	Team leader often creates an atmosphere that is good for innovation	lre9
18	Team leader focuses on the efforts of team members	lre12
19	Team leader inspires members to analyze problems from different perspectives	lre16
20	Team leader provides members with opportunities for development and displaying talent	lre17
21	Team leader cares about the life of members and maintain close contact with members	lre18
22	Team leader will describe the position and meaning of the research direction in the field to team members	lre19
23	Team leader sets a good example with his/her performance in the work	lpa1
24	Team leader is responsible for the work and encourages to take responsibilities	lpa3
25	Team leader encourages members to participate in projects and decision-making	lpa4
26	Team leader encourages members to work together to solve problems	lpa6
number	measurement project	coding

27	Team leader encourages members to provide different opinions on decision-making	lpa8
28	Team leader works as hard as we do	lpa9
29	Letting the situation worse, team leader uses means to combat the rival of his/her close members	lto7
30	Team leaders use threats and dictatorship to suppress criticism	lto9
31	Team leader makes members antagonistic to each other	lto10
32	The team leader stresses group and affinities and care for people having close relationship with him/her	lto11

3 Quantificationally developing the measurement project of innovation team leader leadership behavior

Using a quantitative method to delete the unessential items, then forming the final scale. The paper follows the principles of great importance, strong sensitivity, good representation, strong independence and good distinction, considering items acceptable⁴. Through the questionnaire and using factor analyzing to the data collected, the paper selects the measurement project of innovation team leader leadership behavior.

3.1 Questionnaire and data analysis

From September 2011 to March 2012, using the innovation team funded by Ministry of Education as a research object,author in all issued 500 questionnaires and acquired 465 questionnaires, eliminating 84 invalid questionnaires, getting 381 valid questionnaires.

In addition to the personnel basic information of the sample and the basic information of the innovation team are designed in choice question, the other options are designed by Li Kete 7 scale, and the measure item comes from the item pool in Table 5.

Discrete degree method select measurement project from the perspective of the sensitivity. The study judges by using variation coefficient method, then deletes projects with a variation coefficient less than 0.35: lta15, lta19, lre9. Discrimination analysis method selects measurement project from the point of discrimination and importance⁵. Using T test to measure all projects. If the t-test results reach a significant level, then the project has the ability to identify samples with different degree of reaction, being discriminable; if not, it will be deleted. So under the standard, deleting projects: lta2, lta8, lta15.

Furthermore, through the SPSS analysis, we can know that the internal consistency coefficient is 0.832, greater than 0.8. It shows that the questionnaire has a good reliability and measurement result , and is suitable for statistical analysis. At the same time, the KMO sample measure is 0.922, which means the questionnaire is suitable for exploratory factor analysis. Significant probability of Bartlett spherical test is 0.00, which means the questionnaire has a strong correlation and is suitable for the

factor analysis. This study uses principal component analysis to extract the factor, when selecting measurement project, referring Hair standard, chooses 0.5 as the critical point of the factor loading and deletes projects that do not meet the conditions. Then deleting projects: lta13, lre12. From the variance decomposition principal component extraction, we can find that the cumulative contribution rate from the first four factors has been 84.324%, and the variance contribution rate of factor 1 is relatively high, reaching 27.769%. Therefore ,the result of extracting variance accumulation contribution rate of four factors is more ideal⁶.

From the results of the variance accumulation contribution rate and the rotational component matrix, the measurement projects including the innovation team leader’s innovative task-oriented leadership behavior factors we selected are as the following: LTA1, LTA2, LTA3, LTA4, LTA5, LTA6, LTA7, LTA8. The measurement projects including the innovation team leader’s personnel relationship-oriented leadership behavior factors are as the following: LRE1, LRE2, LRE3, LRE4, LRE5, LRE6, LRE7. The measurement projects including the innovation team leader’s participating in innovation leadership behavior factors we selected are as the following: LPA1, LPA2, LPA3, LPA4, LPA5, LPA6. The measurement projects including the innovation team leader’s toxic/destructive leadership behavior factors we selected are as the following: LTO1, LTO2, LTO3, LTO4.

By using Maximum likelihood method to do the parameter estimation in AMOS statistical software, it turns out that the fitting results of four dimensional hypothesis model of Innovation team leader 4L leadership behavior measurement are ideal. The fitting results of each index are shown in Table 6, where χ^2/df is 2.846, RMSEA is 0.070, NFI is 0.937, TLI is 0.954, CFI is 0.958.

Table 6. Innovative team leader 4L leadership behavior measurement’s four dimensional hypothesis model fitting index table

Fitting index	Absolute fitting index				Relative fitting index		
	χ^2	df	χ^2/df	RMSEA	NFI	TLI	CFI
Fitting result	771.387	271	2.846	0.070	0.937	0.954	0.958

The C.R. value of each measurement index is greater than 1.96, passing the significance test, and the loading factor is greater than 0.5.

3.2 Evaluation on Innovation team leader leadership behavior scale⁷

3.2.1 Structural dimension evaluation

We can know from Table 6, χ^2/df , RMSEA , NFI , TLI and CFI of Innovation team leader leadership behavior scale’s fitting model are ideal. So, we can consider that innovation team leader leadership behavior can be measured by innovative task-oriented leadership behavior, personnel relationship-oriented leadership behavior, participating in innovation leadership behavior and

toxic/destructive leadership behavior. At the same time, the standardized factor load of the 25 measure items in 4 dimensions is greater than 0.71, which indicates that the interpretation ability of each latent variable corresponds to the project is relatively strong.

3.2.2 Reliability evaluation

Construct reliability measures the scale’s internal consistency, shown through Chronbach’s α coefficient in confirmatory factor analysis. The whole reliability of Innovation team leader leadership behavior scale is 0.838, greater than 0.80, and the reliability coefficients of the 4 factors’ each component table are all greater than 0.90.

3.2.3 Validity evaluation

innovation team leader leadership behavior questionnaire is carried out by literature research, investigation and discussion. In order to make contents of the questionnaire more complete and clear, after the first draft of the questionnaire was completed, experts carried on qualitative analysis on title and expression and used quantitative analysis methods to delete the wrong measurement projects⁸. The selection of the sample is based on the innovative team funded by the Ministry of education. So judged from the rationality of the project, content validity of Innovation team leader leadership behavior scale is suitable.

4 Formation of Innovation team leader leadership behavior scale

According to the scale that pass tests of structure dimension, reliability and validity, building the index system of Innovation team leader leadership behavior scale, as shown in figure 1.

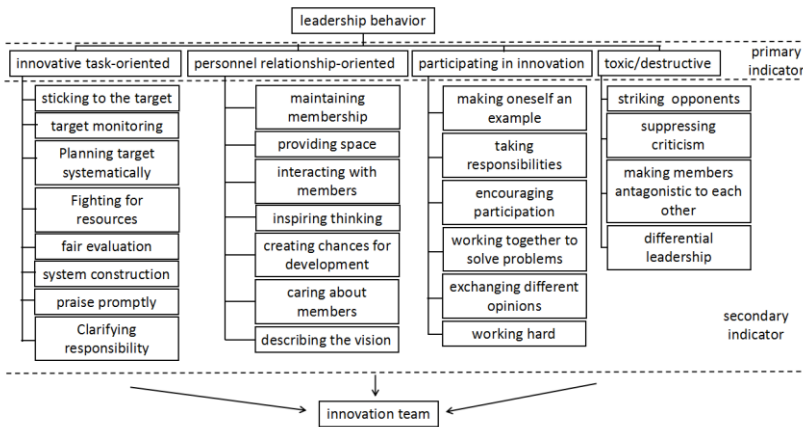


Figure 1. The index system of Innovation team leader leadership behavior scale

The index system of Innovation team leader leadership behavior scale includes innovative

task-oriented, personnel relationship-oriented, participating in innovation and toxic/destructive leadership behavior four primary indicators and sticking to the target, target monitoring and so on twenty-five secondary indicators.

Reference

1. J. R. Hackman, Leading teams: Setting the stage for great performance[M]. Harvard Business School Press, 2002.
2. Zhou Ruichao .The essential qualities and training of scientific and technological innovation team leader[J]. Journal of Guangxi University(Philosophy and Social Science).2012, 34(2):93-96.
3. Huang Guo , Huang Jianan , Geng Wei. Research of Science and technology innovation team leader leadership quality model [J]. Management of Agriculture Science and Technology. 2015(01):90-91.
4. Zaccaro S J,Rittman A L,Marks M A.Team leadership. The Leadership Quarterly . 2001
5. Yan Shi . The reliability and validity of test of <Coach VICTORY leadership behavior scale> based on the structural equation model[J]. Journal of Guangzhou Sport University, 2014, 34(6):45-49.
6. DeShon, R.P., Kozlowski, S.W., Schmidt, A.M., Milner, K. R., Wiechmann, D., A multiple goal, multilevel model of feedback effects on the regulation of individual and team Performance in training [J]. Journal of Applied Psychology, 2004, 89(6):1035-1056.
7. Fan Chuanhao ,Wang Jigan . Study on relationship between the entrepreneurial team heterogeneity and the team effectiveness[J]. Science Research Managemen,2013,08:35-41.
8. Liu Wen. Research on the influencing factors of Chinese government's leadership behavior[J]. Journal of Shanxi Finance and Economics University, 2010(S1):271-272.