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Assessing Factors and Simulating Innovation: A Study of Innovative Capacities Among Data Science Professionals in China

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Abstract

This study aims to analyze the multifaceted factors influencing the innovative capabilities of data science professionals in China and assess the impact of simulations on their innovative skills. The sample comprises seventeen experts who actively participated in discussions and provided 36 perspectives on the factors affecting their innovation abilities. The research methodology utilized the Delphi method, involving four rounds of questionnaires distributed to 363 data science professionals to evaluate the factors affecting their innovation capacity. The data was rigorously analyzed using mathematical statistics and SPSS, with a strong emphasis on questionnaire validity and reliability. In the reliability analysis, Cronbach's α was found to be 0.98, indicating a high level of internal consistency. The research results yielded an average score of 4.79, SD = 0.39, IQR = 1, reflecting a strong consensus among experts in agreement with the research findings. Exploratory factor analysis was employed for validity assessment, revealing that the 12th factor accounted for a cumulative variance explanation rate of 76.54%, exceeding the threshold of 60%, signifying the robust structural validity of the questionnaire data. The study also utilized AMOS software to simulate sample data and assess the influence coefficients of individual, organizational, and family characteristics on innovation capacity, resulting in values of 0.53, 0.39, and 0.22, respectively, all greater than 0, indicating favorable influence relationships. Building upon these findings, a comprehensive model of creativity abilities among Chinese data science professionals is proposed. This research critically examines the innovation potential of data science professionals in Chinese academia, with the overarching goal of enhancing their creative skills and competitiveness within the data science field. Additionally, it lays the theoretical groundwork for fostering innovation within the university setting.

Keywords: Innovative Capacities; Data Science Professionals; Innovation Factors; Data Science Industry; Innovation Simulation

1. Introduction

Rapid technological advancements and the exponential growth of data have ushered in a new era in the field of data science, where innovation and creativity play a pivotal role in leveraging data for economic growth and societal progress. This study delves into the factors that influence the creativity and data-driven innovation of professionals in the field of data science. Education, specialized training, research experience, intrinsic motivation, and a data-centric mindset are all critical components that contribute to enhancing the innovation capacity of data science professionals [1].

Institutional elements, such as fostering a culture of data-driven decision-making, encouraging risk-taking in data exploration, promoting collaboration among data scientists, providing access to research funding, and governmental support for data initiatives, are instrumental in nurturing inventiveness in this rapidly evolving field [2]. In today's interconnected and data-centric world, the role of data-driven decision-making in various domains cannot be overstated. Hence, institutions, including universities, are pivotal in driving progress and attracting top talent across diverse data science disciplines [3].

To attain this, universities must harness their strengths and become the epicenter for nurturing high-level talent and innovation in data analysis, machine learning, and artificial intelligence [3]. Despite significant advancements in the field of data science, the rate of innovation in data-driven decision-making still lags behind in comparison to established data-driven economies. By comprehensively understanding and addressing these factors, universities can create

an environment conducive to enhancing the innovation capacity of data science professionals, thereby improving data analysis methodologies and driving more meaningful insights [4].

Data science and technology are key drivers of economic growth, and China's rapid economic expansion, driven in part by data-driven industries, significantly influences the contribution rate of new data-driven technologies. Investments in data-related innovation, the encouragement of innovation capacity among data science professionals, and the formulation of effective data policies are crucial to fostering innovative skills and achieving groundbreaking data-driven research [5].

An in-depth investigation into the innovative potential of data science professionals is pivotal in advancing China's independent data-driven capabilities and enhancing their expertise in harnessing the power of data [5]. The ability to innovate with data is not only central to the development of a nation but is also a cornerstone of progress in the field of data science. Data science professionals have a crucial role in fostering data-driven innovation, shaping effective data analysis methods, and pioneering data-driven solutions.

Factors influencing innovation in data science encompass a wide range, including psychological, educational, technological, and organizational factors. To enhance the innovation capacity of data science professionals, a thorough analysis of these multifaceted factors is essential. By comprehensively understanding these factors, data science professionals can develop robust data analysis methods that lead to data-driven insights, better decision-making, and societal progress. Focusing on these factors will enable China's data science community to contribute significantly to the development of an innovative, data-driven nation that leads the way in pioneering cutting-edge data solutions and technologies.

2. Literature Review

Innovation has recently been vital to higher education and the knowledge economy. China's rapid expansion and transformation of the innovative skills of university teachers are critical to research excellence. Teaching methods and social progress this literary study examines several factors that influence the creativity of Chinese university professors. This includes the following performance:

2.1. Competent Teaching and Lifelong Learning

Effective teaching and lifelong learning innovative university teachers have teaching skills and a commitment to learning. According to research, teachers who attend workshops and seminars and continue their education employ more creative teaching methods. Teachers use pedagogical knowledge to adjust to new circumstances, explore new methods, and build compelling courses. Positive attitudes and lifelong learning improve female and male instructors' learning skills [6].

2.2. A Supportive Institutional Environment

A helping hand in the institutional culture and university support impacts instructors' inventiveness. Creative institutions that support research stimulate multidisciplinary collaboration and recognize creative initiatives that foster teachers' creativity. As an educator, having access to research funds, labs, and technology can facilitate innovation. One important thing to ponder is that the context of sustainability impacts the outcome

2.3. Collaboration and Networking

Collaborative endeavors have enhanced university teachers' innovation ability. Interactions with colleagues from diverse disciplines and partnerships with industry contribute to exchanging ideas and integrating practical applications into teaching and research. Networking opportunities foster cross-pollination of concepts, leading to the development of innovative approaches that bridge academia and real-world challenges. Gender differences in teacher abilities men are much better teachers than women. Collaboration and in-service training are similar. Structural equation modeling test results show collaboration is important for training and teaching. Encouraging teachers to collaborate effectively generates new ideas and access to national and international teaching resources [8].

2.4. Research Involvement and Publication Output

University professors with good research output and publications are more innovative. Research projects, grants and publications in reputable journals demonstrate their commitment to knowledge expansion. This research approach enhances teaching content and promotes evidence-based methods such as research, teaching theory and practice. Many nations are prioritizing research excellence to advance higher education reform. Our research delves into the relationship between social values and behavioral patterns and how they can enhance academic performance and contribute to achieving research excellence

2.5. Personal Traits and Motivation

Personal characteristics and motivation Influence the innovation development capabilities of university professors. Innovation in teaching and research using Technological Integration and Digital Literacy in the digital age, technological integration, and digital literacy are crucial for enhancing innovation ability. University lecturers proficient in utilizing technology tools, online platforms, and educational software can create interactive and dynamic learning experiences. Embracing digital resources can lead to the development of innovative online courses, blended learning models, and virtual collaboration spaces. Developing digital transformation capabilities in university teaching employing online teaching and adapting to online forms, student value, product and learning outcomes, etc. In conclusion, constructing online models requires enough and enabled study space. A future research goal [9].

2.6. External Recognition and Incentives

External recognition and incentives such as rewards and career advancement opportunities can encourage university professors to enhance their innovation capabilities. Recognition from peers, students and the broader academic community attests to innovative efforts and encourages teachers to explore creative approaches to teaching and research further. Complex interplaying factors, from teaching capacities and institutional support to personal attributes and technological integration, determine the innovation capacity of university professors in China. Future interdisciplinary research and in an educational environment. It creates a creative learning environment and encourages the use of innovative ways of thinking. It can foster and enhance critical thinking and creative consciousness in the long run. This contributes to more holistic, sustainable, socially robust research and higher education learning. Challenging learning can frame and enhance it [10].

2.7. Influencing Factors

Many factors influence the innovation capacity of university faculty, including education, training, teaching experience, work environment, institutional culture, collaboration, networking, research and publication opportunities, technology acquisition, recognition and motivation, professional development, motivation, attitudes, supportive leadership, and student feedback. To sum up, it can be summarized as individual, organizational, and family factors. The relationship between university innovation and its impact on patenting in technology and society plays a role in improving the innovation development efficiency of university teachers [11]. According to the innovation capability investment theory and interaction theory, broad interest, aesthetic sensitivity, tolerance for ambiguity, ease of attraction to complexity, keen intuition, and self-confidence are key personality traits of high innovative ability. Personality characteristics, such as broad interests, independent judgment, autonomy, and firm feelings about innovation, can affect employees' power at the individual level. Factors affecting employees' motivation include cognitive factors, intrinsic motivation, knowledge, and personality characteristics. Positive emotions can lead to new and innovative thoughts and actions. Organizational conditions and managerial action influence executive members' motivation, promoting self-directed values, professional knowledge, and creative thinking skills. Role conflict arises when individuals cannot meet multiple roles simultaneously, affecting their ability to complete necessary activities in other domains. Individuals have various parts, and when individuals have to satisfy one area because of pressure, they do not have sufficient resources or ability to help another. Safrizal explains that work-family conflict is a challenge that arises due to the demands of both work and family. This conflict can be difficult to resolve in certain situations [12].

2.8. Teachers' Teachers 'Innovation Ability

Innovative teachers emphasize critical thinking, adaptability, problem-solving, cooperation, and student-centeredness in the classroom. They use technology and platforms to promote student-centered development, risk-taking, and professional progress. These educators are open to new ideas and adjust to changing circumstances, keeping them open to new technologies and methodologies. The creativity of these educators' fosters engaging and adaptable learning settings that equip pupils with the necessary skills for a shifting global landscape. Emotional skills and university faculty efficiency boost invention. Creativity boosts creativity and efficiency. Organizational learning for emotional development [13].

2.9. Delphi Method

Delphi is a systematic and iterative way to gather and evaluate expert or stakeholder opinions. The Delphi approach is used in business, healthcare, technology, and policymaking to make judgments, create consensus, and study complex issues. The Delphi technique involves selecting various subject-matter experts or stakeholders, such as academics, practitioners, researchers, industry professionals, and others with relevant opinions. First Step; the facilitator or researcher produces questionnaires or surveys to answer important questions. Encourage thoughtful and educated responses using open-ended questions. Round 1, Initial Responses In the first round, experts answered the questionnaire separately. Through qualitative and exploratory remarks, participants can share their views, observations, and predictions regarding the problem. Second Step; after the first round, the facilitator summarizes the responses and crucial points without exposing the experts' identity. In the following rounds, experts receive these simplified responses. In Rounds 2 and beyond, experts are shown the summarized responses from the previous round and can amend or add fresh ideas. Several rounds are normally needed to obtain an agreement or converge responses. Step 3, Consensus Building: As experts polish and adapt their comments based on feedback, opinions and insights typically converge. This helps highlight points of agreement and disagreement and improves topic understanding. Conclusion: After responses stabilize and a consensus is formed, or insights are extensively explored, the facilitator ends the Delphi process. Decision-making, scenario planning, policy formulation, and research can use the final responses. Step 4, The Delphi technique has many advantages: Anonymity; experts' identities are generally kept private, allowing honest comments. Structured Process; the iterative process helps explore complicated subjects methodically. Diverse perspectives; multiple experts from diverse backgrounds ensure complete analysis. Expert consensus; the procedure can identify consensus and disagreement. Flexibility; the Delphi technique can be modified and used remotely, making it suitable for remote participants. Delphi solves real-world problems with expert advice. Delphi's methodology and timely execution are its qualitative research strategies. Delphi uses expert consensus [14].

3. Methodology

Delphi study of Chinese university professors' innovative factors; questionnaire and expert discussion to boost creativity. Delphi collected data for this study. The study used quantitative and qualitative methods to examine data collection, analysis, and statistics. They discussed data collection, statistical analysis, and study equipment. Delphi polled 17 instructional designers on the three ideas [15]. According to this study's needs, the experts are composed of experts from China, including professors from universities, experts from administrative departments, etc. All experts have qualifications in higher education management, have doctoral degrees, have worked for more than five years, and have served as assistant professors at least. These have a more in-depth understanding and research on the innovation ability of Chinese university teachers. Round 1 Brainstorming; the first round collects the influence factors of university teachers' innovation ability. Eighty-three opinions were collected on individual factors, 48 organizational factors, and 27 family factors affecting university teachers' innovation ability. Based on brainstorming, a questionnaire was formed. Round 2 Evaluation of the Experts' Ideas; the second round of comprehensive evaluation of the factors affecting the innovation ability of university teachers in China. It was assessed using the Likert five-point scale. Experts need to assign corresponding scores of 5, 4, 3, 2, 1 (5 = strongly agree, 4 = agree, 3 = Neutral, 2 = disagree, 1 = strongly disagree) to the indicators of the central part of the problem according to the degree of importance, to collect the judgment data of experts on the importance of indicators at all levels and evaluation criteria in the study. If some experts

think an index needs to be revised, they can fill in the revised content in the revision item. If the validity of the index is not high, the deleted item can be selected directly to express deletion. If items have yet to be considered, they can be added in the additional items' column, and the added items also need to be judged for their importance; the same method is used in the third round. On this basis, form questionnaire II. Round 3 Re-evaluation, using the questionnaire II items to integrate the factors that affect the innovation ability of university teachers, form questionnaire III. Round 4 Resolved and reported; questionnaire III solicited 'yes,' 'no,' or 'unsure' answers from 17 experts and formed a report on the impact on university teachers' innovation ability [15].

4. Result

Phase I: Analyze the various aspects that impact university educators' creative capacities and pedagogical approaches via Delphi technology research involved four rounds, with an average of expert opinions increasing, standard deviation decreasing, and coefficient of variation decreasing. The survey used a 1.00 to 5.00 scale, with scores ranging from 1.00 to 1.49 indicating strong disagreement, 1.50 to 2.49 indicating neutrality, 3.50 to 4.49 indicating moderate agreement, and 4.50 to 5.00 indicating strong agreement [16].

Table 1. Individual factors affecting university teachers' innovative ability in China

Individual factors		M	Expert opinion	SD.	IQR	Consensus
1. Innovative thinking	1) Able to see the multi-faceted aspects of the problem and think about the problem from multiple angles	4.82	Strongly agree	.38	1	Congruence
	2) Like to seek different perspectives	4.94	Strongly agree	.24	1	Congruence
	3) Explore and study the incredible connections between things	4.88	Strongly agree	.32	1	Congruence
	4) Have a rich imagination	4.76	Strongly agree	.42	1	Congruence
	5) Be willing to make problem assumptions and seize opportunities for change	4.76	Strongly agree	.42	1	Congruence
	6) Willingness to try new ideas and approaches	4.88	Strongly agree	.32	1	Congruence
2. Innovative personality	7) Curiosity, desire to explore and learn	4.88	Strongly agree	.32	1	Congruence
	8) Be creative, open to new ideas, and think outside the box	4.82	Strongly agree	.38	1	Congruence
	9) Dare to take risks and not be afraid of failure	4.82	Strongly agree	.38	1	Congruence
	10) Resilience, showing perseverance in the face of challenges and setbacks	4.76	Strongly agree	.42	1	Congruence
3. Innovation knowledge	11) Have rich subject expertise to lay the foundation for innovation	4.76	Strongly agree	.42	1	Congruence
	12) Willing to discover the latest research results and development trends in your field	4.82	Strongly agree	.38	1	Congruence
	13) Have an interdisciplinary perspective and be able to integrate different perspectives to promote innovation	4.88	Strongly agree	.32	1	Congruence
	14) Proficiency in research methods, data analysis, and evaluation techniques	4.76	Strongly agree	.55	1	Congruence

From table 1, the result of the report was 17 experts' opinions strongly agreed at 4.82, SD.=0.38, IQR=1, and the consensus of experts was congruence. Individual factors affecting Chinese university instructors' creativity ability: taking a diverse approach to challenges, diversity, exploring excellent connections, being creative, accepting problem assumptions and adjusting, and trying new things. Innovative, creative, risk-taking, resilient, and curious personality, expertise, understanding of current research trends, and an interdisciplinary approach that integrates multiple views enable creativity, research, data analysis, and evaluation skills.

Table 2. Organization factors affecting university teachers' innovation ability in China

Organizational factors		M	Expert opinion	SD.	IQR	Consensus
1. Organizational atmosphere	1) The school encourages teachers to learn actively	4.82	Strongly agree	.38	1	Congruence
	2) Schools tolerate teacher failure	4.82	Strongly agree	.38	1	Congruence
	3) Explore and study the incredible connections between things	4.76	Strongly agree	.42	1	Congruence
	4) The school publicly praises innovators who have achieved innovative results	4.88	Strongly agree	.32	1	Congruence
	5) School leaders have a strong sense of innovation	4.59	Strongly agree	.49	1	Congruence
	6) School leaders dare to take innovative risks	4.88	Strongly agree	.32	1	Congruence
2. Incentives for innovation	7) Schools give innovators monetary rewards and benefits	4.82	Strongly agree	.38	1	Congruence
	8) The school honors or commends innovators	4.59	Strongly agree	.49	1	Congruence
3. Career development	9) Schools provide more training opportunities for innovators	4.76	Strongly agree	.42	1	Congruence
	10) Schools give innovators more opportunities to advance	4.88	Strongly agree	.32	1	Congruence
4. Team building	11) Teachers have clear unity goals and clear assessment standards	4.94	Strongly agree	.24	1	Congruence
	12) The members of the team brainstorm, work, and goals are related	4.76	Strongly agree	.42	1	Congruence
	13) Team members supervise each other and agree with each other	4.59	Strongly agree	.49	1	Congruence
	14) Team members share resources and encourage each other	4.71	Strongly agree	.46	1	Congruence

From table 2, the result of the report was 17 experts' opinions strongly agreed at 4.77, SD.=0.40, IQR=1, and the consensus of experts was congruence. Organizational factors affecting Chinese university teachers' innovation. Organizational performance components, where the school fosters teacher learning, forgives instructors, discovers complicated relationships, and recognizes inventors publicly. School leaders innovate, school leaders take unique risks, administrators encourage innovation, schools reward inventors financially, schools honor inventors, career growth, schools train innovators, schools nurture innovators, teachers set clear goals and assessment standards, teams think, work and achieve goals, team members coordinate tasks, team members cooperate, support, and share resources.

Table 3. Family factors affecting university teachers' innovation abilities in China

Family factors		M	Expert opinion	SD.	IQR	Consensus
Family atmosphere	1) Family life is harmonious and warm	4.76	Strongly agree	.42	1	Congruence
	2) Family faces financial pressure	4.88	Strongly agree	.32	1	Congruence
	3) Family members provide support for housework understanding	4.88	Strongly agree	.32	1	Congruence
Job support	4) Family members better handle conflicts	4.82	Strongly agree	.38	1	Congruence
	5) Family members offer helpful work advice	4.82	Strongly agree	.38	1	Congruence
	6) Family members do not influence job development	4.71	Strongly agree	.46	1	Congruence
	7) Family members offer work assistance through social relationships	4.71	Strongly agree	.46	1	Congruence

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8) Provide teachers with more autonomy	4.76	Strongly agree	.42	1	Congruence

From table 3, the result of the report was 17 experts' opinions strongly agreed at 4.77, SD.=.40, IQR=1, and the consensus of experts was congruence. University teachers should cultivate a positive family environment and gain backing from their relatives. Balancing personal and professional aspects is crucial for their well-being and teaching effectiveness. By doing so, teachers exemplify healthy work-life equilibrium for students. Family backing equips them to navigate the challenges of academia better.

A questionnaire was administered to four hundred teachers in 23 universities in China, with a 90.75% recovery rate. The data statistics using SPSS 28 statistical analysis software on Chinese university teachers' innovation ability influence factors from individual, organizational, and family factors are analyzed, the evaluation system of Chinese university teachers' innovation ability is analyzed, and the overall reliability test. Table 4 shows the reliability test results of the questionnaire.

Table 4. Reliability statistics for influencing factors

Factors influencing decision-making	Cronbach's α	List of items
Individual factors impact decision-making	.94	14
Organizational Factors impact decision-making	.93	14
Family factors impact decision-making	.89	8
Total	.98	36

When Cronbaha 's α >.7, the reliability of the questionnaire is in the normal range; when Cronbaha's α >.8, the questionnaire's reliability is excellent. From tale 4, the overall reliability of the questionnaire is .98, showing high-reliability coefficients for individual, organizational, and family factors. The credibility of these indicators is high, and they are reasonable and credible. The following takes the individual factor part as an example to illustrate the process of validity testing. KMO and Bartlett's test should be conducted before factor analysis to determine suitability. Table 5 is the result of factor analysis.

Table 5. KMO and Bartlett's test for individual factor dimensions

KMO and Bartlett's test for individual factor dimensions		
KMO sampling suitability and quantity		0.94
Bartlett's spherical test measures the surface's spherical	Chi-square approximation.	4018.73
	Df.	91
	Sig.	<.001

When the value of KMO is between 0 and 1, the closer the statistic is to 1, the stronger the correlation between variables is, and the better the effect of factor analysis is. In practical examination, the result is better when the KMO statistic is above .7; when the KMO statistic is less than 0.5, it is unsuitable for applying factor analysis [17]. Table 5 shows the KMO value for the individual factors section is .938, with a significance <0.001, indicating suitability for factor analysis.

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Table 6. Common factor variance

Common factor variance		
Project*	Initial stage	Extracting information
a1	1	.86
a2	1	.74
a3	1	.76
a5	1	.74
a4	1	.70
a5	1	.68
a7	1	.87
a8	1	.74
a9	1	.77
a10	1	.78
a11	1	.85
a12	1	.75
a13	1	.75
a14	1	.75

*Project summary: specific items of individual factors affecting university teachers' innovation ability

When extracting factors, specify that the minimum eigenvalue of the common factor to be extracted is 1. As shown in Table 6, in the individual factor dimension, the variance of the extracted common factors is more significant than .5, which means that all the indicators can be explained, and there is no need to eliminate the indicators.

Table 7. Variance explained for "individual factor dimensions"

Total variance interpretation						
Component	Initial eigenvalue			The sum of the squares of the extracted load		
	Total	Per cent variance	Cumulative%	Total	Per cent Variance	Cumulative%
1	8.00	57.20	57.20	8.008	57.20	57.20
2	1.46	10.44	67.69	1.462	10.44	67.64
3	1.27	9.08	76.72	1.272	9.08	76.72
4	.43	3.10	79.77			
5	.40	2.86	82.65			
6	.38	2.69	85.33			
7	.36	2.56	87.90			
8	.33	2.33	90.23			
9	.31	2.21	92.43			
10	.29	2.04	94.47			
11	.26	1.87	96.34			
12	.20	1.40	97.74			
13	.17	1.20	98.93			
14	.15	1.07	100			
Extraction method: principal component analysis						

The total variance explained by the dimensions of the individual factors section is shown in table 7, where the initial eigenvalue of the first component is 8.008, which is greater than 1; the initial eigenvalue of the second component is 1.46, which is greater than 1; the initial eigenvalue of the third component is 1.27, which is greater than 1; from the fourth component, the initial eigenvalues are all < 1. The total contribution rate of the three common factors is 76.72, which means the three common factors can explain about 76.72% of the total variance (> 60%), which is considered ideal when it reaches more than 60% [20]. Similarly, the validity of organizational and family factors can be seen in Table 8 and Table 9. The validity is greater than 60%.

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Table 8. Total variance explained for "organizational factor dimensions"

Total variance interpretation						
Component	Initial eigenvalue			The sum of the squares of the extracted load		
	Total	Per cent variance	Cumulative%	Total	Per cent variance	Cumulative%
1	7.48	53.43	53.43	7.48	53.43	53.43
2	1.68	12.02	65.46	1.68	12.02	65.46
3	1.06	7.59	73.05	1.06	7.59	73.05
4	.91	6.46	79.51			
5	.41	2.92	82.43			
6	.39	2.79	85.21			
7	.36	2.55	87.76			
8	.34	2.39	90.15			
9	.32	2.25	92.40			
10	.28	1.99	94.38			
11	.24	1.68	96.07			
12	.214	1.53	97.59			
13	.182	1.30	98.89			
14	.155	1.11	100			
Extraction method: principal component analysis						

Table 9. Total variance explained for "family factor dimensions"

Total variance interpretation						
Component	Initial eigenvalue			The sum of the squares of the extracted load		
	Total	Per cent variance	Cumulative%	Total	Per cent variance	Cumulative%
1	4.66	58.29	58.29	4.66	58.29	58.29
2	1.60	19.95	78.23	1.56	19.95	78.23
3	.40	4.94	83.17			
4	.33	4.15	87.32			
5	.32	4.02	91.34			
6	.32	3.94	95.28			
7	.22	2.79	98.05			
8	.16	1.95	100			
Extraction method: principal component analysis						

The researchers chose exploratory factor analysis to analyze the total variance explanation table and rotation component matrix table through the calculation of SPSS 28 software, as shown in Table 10:

Table 10. Validity analysis of the questionnaire

Element	Initial eigenvalue			The sum of squares of the rotation load		
	Total	Per cent variance	Cumulative%	Total	Per cent variance	Cumulative%
1	25.18	44.97	44.97	5.49	9.80	9.80
2	2.518	4.50	49.47	4.92	8.79	18.59
3	2.47	4.41	53.87	4.77	8.52	27.11
4	2.06	3.68	57.55	4.60	8.21	35.31
5	1.94	3.47	61.02	4.32	7.71	43.03
6	1.54	2.76	63.78	4.16	7.44	50.46
7	1.45	2.59	66.37	3.18	5.67	56.13
8	1.32	2.35	68.72	2.95	5.27	61.40
9	1.26	2.25	70.97	2.82	5.03	66.43
10	1.19	2.12	73.09	2.46	4.37	70.82
11	1.05	1.88	74.97	1.74	3.10	73.92
12	.88	1.57	76.54	1.47	2.62	76.54
13	.61	1.08	77.62			

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14	.58	1.04	78.66
15	.54	.97	79.63

From table 10 shows that the percentage of the first factor in the total variance explanation table is 9.797% < 40%, indicating no standard severe method deviation problem in this data group. Second, observe the 12th factor in the table after the rotation cumulative variance explanation rate; the value is 76. 54% > 60%, indicating that the 12 factors can effectively represent 76. 54% of the questionnaire information [18]. Putting the statistical results into AMOS 21, get the results shown in Table 11

Table 11. Analysis of influence factors of independent variables on the dependent variable

	Estimate	SE.	CR.	*p* value
Innovation Ability<---Individual Factors	.53	.04	11.86	< .001
Innovation Ability<--- Organizational factors	.40	.04	9.93	< .001
Innovation Ability<---Family Factors	.22	.04	5.26	< .001

It can be seen from Table 11 that the influence coefficients of personal factors, organizational factors, and family factors on innovation ability are .53, .40, and .22, respectively, all > 0, indicating a positive impact; the significance p value of the three dimensions < .001, suggesting that they are all Can positively affect teachers' innovative ability. Therefore, personal, organizational, and family factors significantly positively affect innovation ability [19].

Phase II: Analyze simulation's effects on university lecturers' innovative capabilities.

Using AMOS 21 for further analysis, the model operation results can be obtained, as shown in Figure 1.

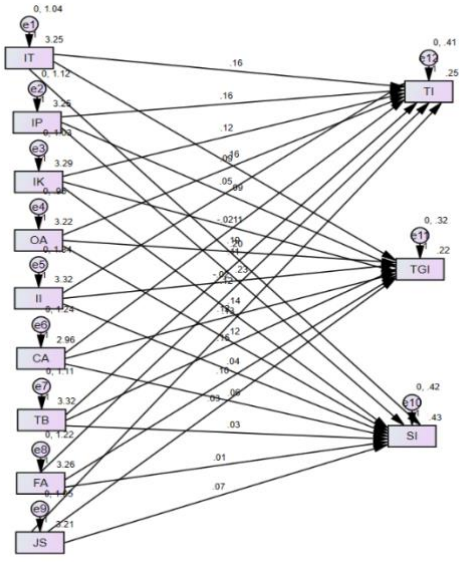

Figure. 1. The independent variable's influencing variables on the dependent variable

The second step is the dimensional analysis of the influencing factors. The results of the AMOS analysis are shown in Figure 2.

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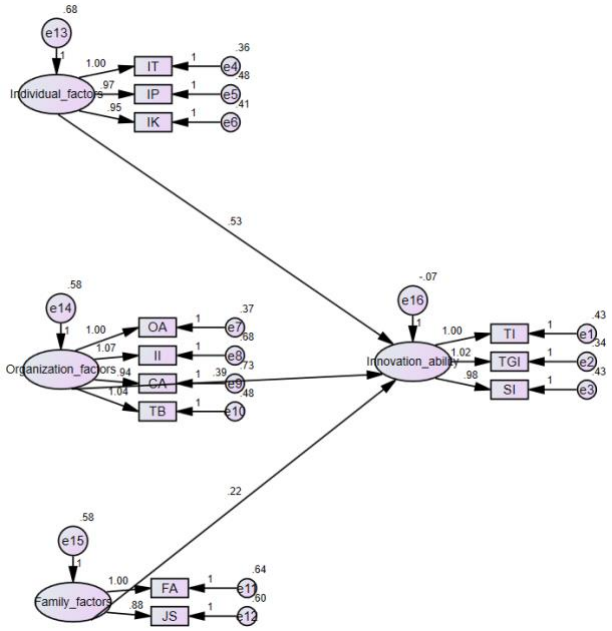
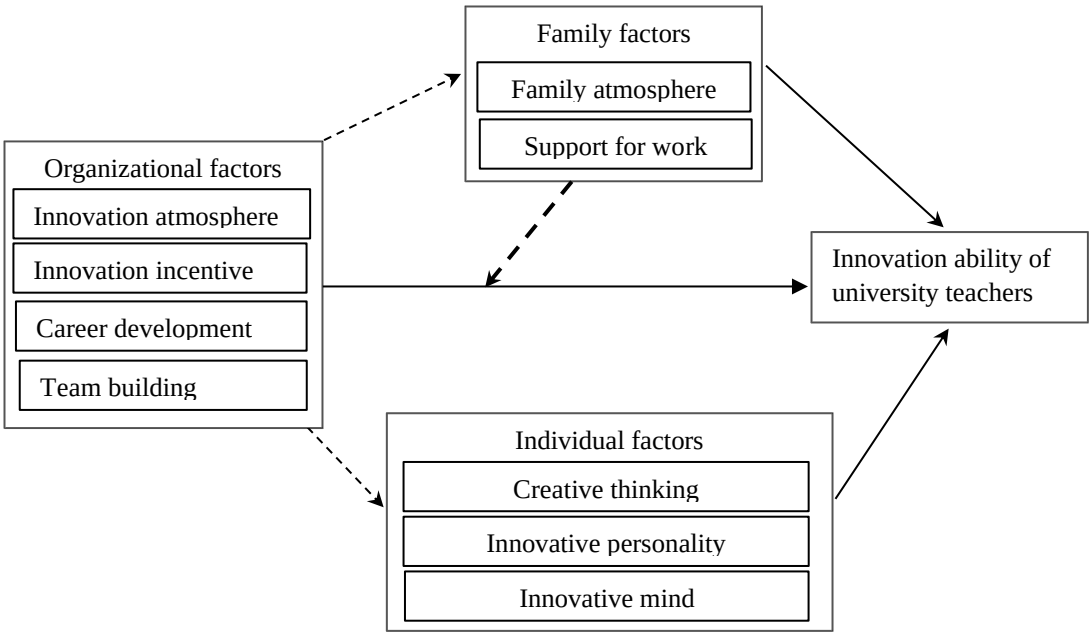


Figure. 2. Analysis of the dimensions of independent and dependent variables' effects

According to the simulation results of the AMOS model, a model was created to analyze factors affecting Chinese university teachers' innovative ability, as shown in Figure 3.



- Individual, organizational, and family factors directly affect innovation ability.
- Organizational factors mediate individual and family factors.
- Family factors moderate individual and organizational factors.

Figure. 3. A model of factors affecting university teachers' innovation ability in China

Various factors, including personal, organizational, and familial aspects, play a direct role in shaping the innovative capabilities of university instructors. Organizational factors have an indirect influence on individuals and families,

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subsequently impacting their creativity. Similarly, family-related factors indirectly affect organizational growth and, consequently, the innovative potential of university instructors.

Creative thinking involves the capacity to generate fresh and imaginative ideas, solutions, and viewpoints by surpassing traditional boundaries and exploring unconventional avenues. An innovative personality is marked by a natural inclination to produce original and pioneering ideas, approaches, and solutions, while embracing change and pushing the limits of conventional thinking. Innovative thinking, on the other hand, refers to a cognitive predisposition to continually seek, create, and implement inventive ideas and concepts, often leading to innovative solutions and advancements.

Innovative thinking plays a crucial role in enhancing the innovative abilities of university educators. It fosters a mindset that actively seeks novel perspectives, creative teaching methods, and innovative approaches to curriculum development, teaching techniques, and student engagement. This kind of thinking encourages educators to adapt to evolving educational landscapes, experiment with cutting-edge technologies, and cultivate an environment of continuous improvement [21]. By embracing innovative thinking, university instructors become better equipped to address diverse learning styles, challenges, and opportunities. Consequently, this enriches the educational experience and contributes to the advancement of knowledge within the academic community.

An innovation-friendly environment is one that encourages and supports creative thinking, experimentation, and the development of novel ideas within an organization or community. Innovation incentives, such as recognition and resources for innovative ideas, serve as motivating factors. Career development opportunities play a role in the ongoing process of acquiring skills, experiences, and knowledge to enhance one's professional growth and overall success. Team building involves activities and strategies aimed at enhancing collaboration, communication, and cohesion among team members to improve collective performance and achieve shared goals.

An innovation-friendly atmosphere, characterized by open communication and a willingness to experiment, nurtures a mindset of creative thinking among university instructors. Innovation incentives, including recognition and resources for fresh ideas, act as motivators. Opportunities for career development provide a chance to acquire new skills and experiences, thereby enriching innovative capabilities. Team building fosters collaborative synergy, enabling the exchange of diverse perspectives and knowledge. Collectively, these factors empower university educators by creating a supportive environment, offering incentives, developing skills, and fostering collaborative networks. Ultimately, this enhances their capacity for innovation and contributes to advancements in education and research.

A family atmosphere refers to a warm, supportive, and harmonious environment within a group or setting, characterized by close relationships, mutual care, and a sense of belonging. The concept of 'family support for work' implies improved work-life balance, enhanced job satisfaction, and increased employee retention due to the provision of resources and understanding regarding familial responsibilities and needs.

A positive family atmosphere and robust family support for work positively impact the innovation of college faculty by creating an environment where faculty members feel emotionally and practically supported in managing their work-life balance. This reduces stress related to familial responsibilities, freeing up cognitive and emotional resources for creative thinking, experimentation, and the generation of innovative ideas in their teaching, research, and overall academic pursuits.

5. Conclusions and Evaluation

The study has two phases. In the first phase, the variables that influence the capacity for innovation of university professors are analyzed, including their interactions with each other. In the second phase, a model for improving the innovative capacity of university professors will be developed by identifying the factors that influence it. Researchers have identified the key factors affecting instructors' innovation ability through a comprehensive survey and Delphi techniques. The reliability and validity of these factors were verified and analyzed using SPSS statistical methods and a questionnaire, ensuring the model's scientific rigour [22]. According to the study's conclusion, there is a model that shows the factors influencing the ability of Chinese university professors to innovate. The study found that individual,

organizational, and family factors directly impact university teachers' innovative abilities. Organizational factors mediate the relationship between family factors and university teachers' innovative ability, an organizational corporate culture that influences management towards managing systems that support and innovate, while family factors play an intermediary role [23]. By leveraging these findings, Encouraging the creative skills of their faculty can help Chinese universities improve the quality of education by addressing these issues. Universities can take proactive steps to foster a culture of innovation among their faculty and staff, leading to continuous improvement and enhanced student learning outcomes. Organizations should create an innovative atmosphere and incentive system to enhance university teachers' innovation capacity. Continued exploration of these factors will undoubtedly shape the future of education, enabling teachers to embrace innovative practices and adapt to the changing educational landscape.

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