THE ROLE OF LEADERSHIP DEVELOPMENT IN FOSTERING SURGEON INNOVATION BEHAVIORS: EXPLORING THE MEDIATING EFFECTS OF PSYCHOLOGICAL EMPOWERMENT IN CHINESE HOSPITALS

WEI XIANGLI

A dissertation submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy in Management

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DECLARATION

I, Wei Xiangli, hereby certify that the work embodied in this dissertation entitled "The Role of Leadership Development in Fostering Surgeon Innovation Behaviors: Exploring the Mediating Effects of Psychological Empowerment in Chinese Hospitals" is result of original research and has not been submitted for a higher degree to any other university or institution.

Wei Xiangli

(Wei Xiangli)

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Author Wei Xiangli

Dissertation examination committees reach consensus to approve this dissertation.

Chairperson .....
(Associate Professor Dr. Kulachet Mongkol)

Member .....
(Assistant Professor Dr. Liou-Yuan Li)

Member .....
(Dr. Pattsornkun Submahachok)

Member/Advisor .....
(Dr. Karnjira Limsiritong)

Member/Co-Advisor .....
(Dr. Burin Santisarn)

Graduate School of Siam University approved to accept this dissertation in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Management

.....
(Associate Professor Dr. Chaiyanant Panyasiri)

Dean of Graduate School of Management

Date : 12 July 2025

ABSTRACT

Title : The Role of Leadership Development in Fostering Surgeon Innovation Behaviors: Exploring the Mediating Effects of Psychological Empowerment in Chinese Hospitals

Author : Mr. Wei Xiangli

Degree : Doctor of Philosophy

Major : Management

Advisor : .....
(Dr. Karnjira Limsiritong)

Co-Advisor : .....
(Dr. Burin Santisarn)

The objectives of this research were: 1) To determine the interconnections among leadership development, psychological empowerment, and innovation behaviors of surgeons within hospital settings in China; 2) To investigate the role of leadership development in surgeon innovation behavior in the context of hospitals in China.

This research employed a mixed-methods approach. The quantitative component involved 450 structured questionnaires distributed to participants in hospitals in China. The qualitative component consisted of in-depth interviews with 12 individuals: eight surgeons, two hospital leaders, and two government health officials. The data were analyzed using descriptive statistics, including frequency, percentage, mean, and standard deviation, as well as confirmatory factor analysis and structural equation modeling (SEM).

The results indicated that leadership development had a direct impact on surgeon psychological empowerment and innovation behaviors in hospitals in China. Psychological empowerment had a direct effect on surgeon innovation behaviors in China. Psychological empowerment mediated the relationship between leadership development and surgeon innovation behaviors in hospitals. These findings provide

new insight into leadership development in healthcare, revealing that psychological empowerment plays a key mediating role in the process.

Keyword: leadership development, psychological empowerment, innovation behavior

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With this acknowledgment, I extend my highest respect and heartfelt thanks to everyone who has cared for, supported, and helped me along the way.

Wei Xiangli

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CHAPTER 1
INTRODUCTION

1.1 Background of the problem

Since the initiation of reform measures in China, the nation's healthcare system has undergone significant advancements. Between the years 1981 and 2018, the mean life expectancy in China experienced an increase from 68 years to 77 years (Xinhua News, 2019). This steady rise in life expectancy reflects China's remarkable transformation from conditions of scarcity and inadequate medical care to an era characterized by material abundance and improved access to healthcare. According to the China Health Statistical Yearbook (2022), China had 36,570 hospitals of all kinds in 2022. In the year under consideration, there existed a total of 4,287,604 actively practicing (assistant) physicians, signifying a quadrupling in numbers compared to the initial phase of reform and liberalization; furthermore, the ratio of practicing (assistant) physicians was recorded at 3.15 per 1,000 individuals in China, positioning the nation near the middle-upper tier of the international spectrum regarding physician density per capita; concurrently, the aggregate number of hospital beds within the Chinese healthcare system amounted to 7,414,228, reflecting an augmentation of 300,000 beds in comparison to the preceding year; additionally, the volume of outpatient consultations conducted in hospitals across China escalated to 3.88 billion in the year 2022. These demonstrate significant advancements in public health and socio-economic development. The medical and health services of China have experienced significant expansion, as evidenced by the data presented in Table 1.1.

In the realm of health care within China, public hospitals have historically occupied a pivotal position and have emerged as the fundamental entity in guaranteeing the well-being of the entire populace. In contrast, private hospitals, though growing in number in recent years, still lag in terms of overall strength and resource accumulation. As evidenced by Table 1.1, in the year 2022, despite the presence of only 11,804 public hospitals in China

in contrast to 24,766 private hospitals, the quantity of physicians employed in public hospitals is 2.5 times greater than that in private hospitals; the total number of beds available in public hospitals is 2.4 times higher than that in private hospitals; and the frequency of outpatient consultations conducted in public hospitals is 5.3 times that observed in private hospitals. Furthermore, with regard to the quantity of tertiary medical institutions, which represent the apex classification in China, public healthcare facilities are 5.7 times more prevalent than their private counterparts. Overall, public hospitals serve as the backbone of basic healthcare, while private hospitals supplement the system by offering high-end services. Importantly, despite differences in ownership and management models, both public and private hospitals maintain fundamentally consistent standards in physician regulation. All physicians are required to comply with national licensing requirements, clinical protocols, and ethical guidelines, ensuring the quality and safety of medical care.

Table 1.1

2022 China's Health Industry Related Information Table

<table>
<tr><td colspan="3">Number of Hospitals in China</td><td colspan="3">Number of Practicing (Assistant) Physicians in China</td></tr>
<tr><td rowspan="2">36,570</td><td>Public Hospitals</td><td>Private Hospitals</td><td rowspan="2">4,287,604</td><td>Public Hospitals</td><td>Private Hospitals</td></tr>
<tr><td>11,804</td><td>24,766</td><td>3,082,533</td><td>1,205,071</td></tr>
<tr><td colspan="3">Number of Hospital Beds</td><td colspan="3">Number of Medical Visits</td></tr>
<tr><td rowspan="2">7,414,228</td><td>Public Hospitals</td><td>Private Hospitals</td><td rowspan="2">3,883,801,000</td><td>Public Hospitals</td><td>Private Hospitals</td></tr>
<tr><td>5,207,727</td><td>2,206,501</td><td>3,270,893,000</td><td>612,908,000</td></tr>
<tr><td colspan="6">Hospital Grade</td></tr>
<tr><td></td><td colspan="2">Tertiary Hospital</td><td>Secondary Hospital</td><td colspan="2">Primary Hospital</td></tr>
<tr><td>Public Hospitals</td><td colspan="2">2789</td><td>5718</td><td colspan="2">2193</td></tr>
</table>

Private Hospitals	**486**	**5130**	**10456**
Total	**3275**	**10,848**	**12649**

Source: China Health Statistical Yearbook (2022)

At the end of 2021, there were 437,335 surgeons in China (National Health Commission, 2022). To become surgeons. They need to complete 3-5 years of clinical medicine studies in college. After graduation, they need to go to a standardized residency training for 3 years before engaging in diagnosis and treatment independently. Through their efforts, Chinese surgeons have promoted remarkable progress in China's surgical cause. Chinese surgery has reached or is close to global leadership in minimally invasive surgery, organ transplantation, precision surgery, and regenerative medicine (Jiang Shiliang, 2022; Wu Zhifei, 2021). For instance, regarding the domain of invasive surgical procedures, the incidence rate within China has escalated from 8.8% to 14.2% during the period from 2016 to 2021, ultimately achieving a rate of 15.1% in the year 2022 (Qianzhan Economist, 2023).

However, the significant advancements achieved in the domain of surgical practice within China in recent years, practitioners of surgery in China encounter a multitude of challenges in their professional endeavors. These challenges are mainly centered on the application of new technologies, surgical safety, leadership development, team building, and professional stress.

In the context of the implementation of advanced technologies, it is evident that the deployment of such innovations necessitates not only substantial financial resources but also pertinent professional expertise, particularly in the utilization of sophisticated technologies such as robotic surgery and artificial intelligence-assisted methodologies (Moglia et al., 2021). On the other hand, the application and popularization of new technologies are also limited by various aspects such as infrastructure, equipment maintenance, and technician training. Numerous surgeons operating within primary healthcare facilities and in small to medium-sized urban centers frequently encounter

delays in accessing contemporary surgical methodologies and apparatus, thereby impeding the integration of innovative technologies (Jin et al., 2020). In the year 2019, the frequency of minimally invasive surgical procedures conducted per million individuals in China stood at 8,514, reflecting a penetration rate of 38.1% when juxtaposed with the figures from the United States. In contrast, the number of surgeries in the United States during the same period was 16,877, with a penetration rate of 80.1% (Meiri Caibao, 2022).

Surgical complications remain prevalent in certain healthcare institutions in China, particularly in complex procedures such as liver transplants, cardiac surgeries, and neurosurgical operations (Liu et al., 2022). A multicenter study reported an approximate 3% incidence of incision infections in general surgery (Zhang et al., 2020). In contrast, standardized surgical safety protocols in many European countries have contributed to lower infection rates, often below 3%, as observed in the UK and the Netherlands (Wilson et al., 2018). The complication rate for complex surgeries in leading Chinese hospitals ranges from 5% to 10% (Li et al., 2020), compared to 3% to 7% in Europe (Henrik & Pierre-A, 2021). In response, China's National Health Commission issued the Action Plan for Comprehensively Improving Medical Quality (2023–2025) to promote surgical safety and quality. Strengthening surgeons' innovation capacity through technological advancement, policy initiatives, training, and quality control has thus become a key mandate for hospitals nationwide.

Beyond technical expertise, surgeons require strong leadership skills to guide surgical teams in complex, high-risk environments (Cobianchi et al., 2021; Paige et al., 2021). However, leadership development and team building among surgeons in China remain insufficient. Leadership education is largely absent in both undergraduate and postgraduate medical training, reflecting a broader international trend. Till et al. (2020) highlighted a lack of emphasis on leadership training due to the enduring apprenticeship model and a shortage of educators equipped to deliver structured leadership development. In China, surgeons face limited access to leadership training, with few institutional frameworks or career development pathways in place (Wang et al., 2021). Team building also faces challenges; frequent reconfiguration of surgical teams by case type contributes

to unfamiliarity, poor communication, and limited collaboration (Kumar et al., 2019). Alsabri et al. (2022) similarly identified issues including unclear roles, inadequate skills, and lack of psychological safety.

Chinese surgeons usually suffer from high occupational stress. A survey study showed that 81.1% and 83.4% of surgeons believed that their work intensity was high and their work pressure was high (Xiao Dan et al., 2023). In China, the occurrence of physician-patient conflicts also places a greater psychological burden on surgeons (Zhou et al., 2022). Wanga et al. (2021) showed that frequent physician-patient conflicts and violence reduced physicians' professional enthusiasm and led to their lack of self-efficacy and influence at work.

To address these challenges, the ability and motivation of surgeons to innovate have been enhanced by improving the leadership development of Chinese surgeons, promoting surgical team building, and enhancing surgeons' sense of professional significance and autonomy. Within the domain of healthcare, innovation emerges as a fundamental element in enhancing medical quality, augmenting operational efficiency, and enriching the patient experience (Berry, 2019). In surgery, innovation through the introduction of advanced surgical techniques, improved surgical procedures, and the application of new medical equipment allows physicians to better deal with complex cases and reduce surgical risks, complications, and infection rates (Seidelman et al., 2023).In addition, by cultivating surgeons' innovation capabilities, surgical success rates and patient satisfaction can be significantly improved (Liu et al., 2021).

Leadership development has an important impact on innovation(Benitez et al., 2022). Leadership development is defined as expanding the collective capacity of organizational members to engage effectively in leadership roles and processes (McCauley & Van Velsor, 2004). Through systematic training and improvement, leadership development helps individuals enhance leadership skills such as strategic thinking, team management, and decision-making, enabling them to better identify and seize innovation opportunities and promote organizational change and development (Antonakis & House, 2014). The implementation of comprehensive leadership training programs can cultivate a

variety of leadership styles, empower leaders to adaptively respond to a multitude of circumstances, foster the creativity and motivation of team constituents, and consequently augment the overall innovative capacity of the organization (Choi, Kim, & Kang, 2017).

For surgeons, the role of leadership development is particularly important. In a complex surgical environment, surgeons need not only to have superb technical capabilities but also excellent leadership to lead the team to work together efficiently under high pressure to ensure the safety and success rate of the operation (Haleem et al., 2022). Through leadership training and the ability to collaborate with physicians in other disciplines, surgeons will be more confident in their innovation (Folkman et al., 2019). In recent years, some of China's leading hospitals have begun to emphasize leadership development for physicians. For example, Peking Union Medical College Hospital (PUMC), one of the top medical institutions in China and a leader in medical education and clinical practice, has an "Excellence in Physician Leadership Development Program" that is specifically designed for young and mid-career key physicians, especially surgeons who play important roles in the operating room and interdisciplinary teams (Yang, 2019). These programs typically include leadership theory, team management, communication skills, conflict resolution, and healthcare management.

Psychological empowerment pertains to the employees' subjective interpretation of significance, sense of efficacy, autonomy, and impact within the workplace, representing a condition of intrinsic motivation (Spreitzer et al., 1999). Surgeons often feel burdened by their work due to intense work environments, the complexity of the surgery, and patient safety and prognostic pressures, which can affect their professional satisfaction and performance (Al-Ghunaim et al., 2022). Enhancing surgeons' sense of psychological empowerment is of great importance. On the one hand, increasing the sense of psychological empowerment can help surgeons cope with stress and challenges more positively and increase their perception of the meaning of their work and autonomy, which can improve job satisfaction and mental health (Fayn et al., 2021). Conversely, empirical research has indicated that surgeons possessing a heightened sense of psychological

empowerment demonstrate increased innovation and enhanced quality of patient care within clinical settings (Raghavan & Madawana, 2021).

At present, there exists a significant deficiency in scholarly inquiry, especially empirical investigations, pertaining to the domains of surgical leadership and innovation (Geerts et al., 2020). This scarcity highlights the importance of more comprehensive research in this area. Understanding the relationship between surgeons' leadership development and innovation behaviors is critical to surgeon innovation. Therefore, studying the mechanism of leadership development to promote innovation of Chinese surgeons from the perspective of leadership and improving the level and ability of surgical treatment has certain theoretical significance and practical value for the "Healthy China" strategy being implemented.

1.2 Significance of the Problem

Surgeons in China face many challenges. On the one hand, individuals frequently encounter substantial pressures associated with their professional responsibilities; on the other hand, they are encumbered by the intricate nature of interdisciplinary collaboration and the imperative to perpetually innovate in order to enhance the quality of patient care. Despite their technical expertise, surgeons' leadership development has long been under-emphasized, resulting in gaps in communication, team building, and psychological empowerment. These challenges hinder surgeons' ability to effectively innovate and manage their teams. Enhancing the leadership development of surgeons can substantially augment their capacity to navigate these challenges, foster interdisciplinary collaboration, and facilitate innovative approaches to surgical diagnosis and treatment, thereby ensuring patient safety and quality of care. Consequently, it holds considerable theoretical importance and practical relevance to investigate the nexus between leadership development and the innovative behaviors exhibited by surgeons, along with the underlying mechanisms influencing this relationship. The significance of this study is specifically reflected in the following aspects:

1) Promoting surgeon leadership development

Exploring the key factors and effective strategies in surgeons' leadership development and revealing their role in promoting innovation and surgical team collaboration can promote the continuous improvement of surgeons' leadership.

2) Improving the innovation ability of surgeons

Effective leadership development can cultivate physicians' decision-making ability and ability to cope with challenges, effectively solve problems encountered during surgery, help physicians better deal with complex problems, and stimulate their innovative potential.

3) Enhancing a sense of psychological empowerment

The augmentation of psychological empowerment confers upon surgeons an enhanced degree of autonomy and an elevated sense of accountability in the decision-making process, thereby augmenting their motivation and propensity to explore innovative methodologies. Empowered surgeons are more inclined to take risks with innovative approaches, experiment with unconventional techniques, and share their knowledge, thus fostering team collaboration and driving continuous innovation in the medical field.

4) Improving medical quality

Enhancing surgeon leadership significantly enhances their communication and motivational skills, leading to further team cohesion and motivation to innovate, which in turn drives surgical teams to innovate in techniques, strategies, and operational approaches. Ultimately, promote the high-quality development of medical undertakings.

1.3 Research Questions

Against the backdrop of healthcare system transformation and the pursuit of high-quality development, hospitals are facing increasing pressures related to technological innovation and service improvement(Ekasari et al., 2024). As a key driving force in medical advancement, surgeons are not only responsible for complex clinical decision-

making but are also expected to take initiative in technological innovation, process optimization, and team collaboration(Yun et al., 2024). In recent years, leadership has emerged as a critical tool for enhancing physicians' managerial capabilities and promoting organizational innovation(Badriyah et al., 2024). However, how to effectively stimulate surgeons' innovation behavior through systematic leadership development mechanisms has become a key issue in both academic research and hospital management practice.

Although prior investigations have examined the effects of diverse leadership paradigms on hospital efficacy and physician conduct, there persists considerable opportunity for additional inquiry in the subsequent domains: On one hand, extant literature predominantly emphasizes the ramifications of leadership on institutional performance or overarching employee conduct (Mishra et al., 2024; Serang et al., 2024), while relatively limited attention has been paid to how leadership specifically affects surgeons' innovation behavior. It is necessary to integrate leadership development theories to examine how leadership development influences individual innovation among surgeons and thereby expand the scope of leadership development research.

On the other hand, existing studies often take a structural perspective to examine the direct relationship between leadership development and innovation outcomes(Wiroonrath et al., 2024), lacking in-depth analysis of the underlying psychological mechanisms. However, within the high-pressure and complex human environment of hospitals, surgeons' innovation behaviors are often significantly influenced by their psychological perceptions and intrinsic motivation(Meeusen et al., 2024). Applying psychological theories to investigate this process can help uncover the internal mechanisms through which leadership stimulates innovation(Alshahrani et al., 2025).

Based on the above discussion, this study proposes the following two research questions:

1. What are the relationships among leadership development, psychological empowerment, and surgeon innovation behavior in the context of hospitals in China?

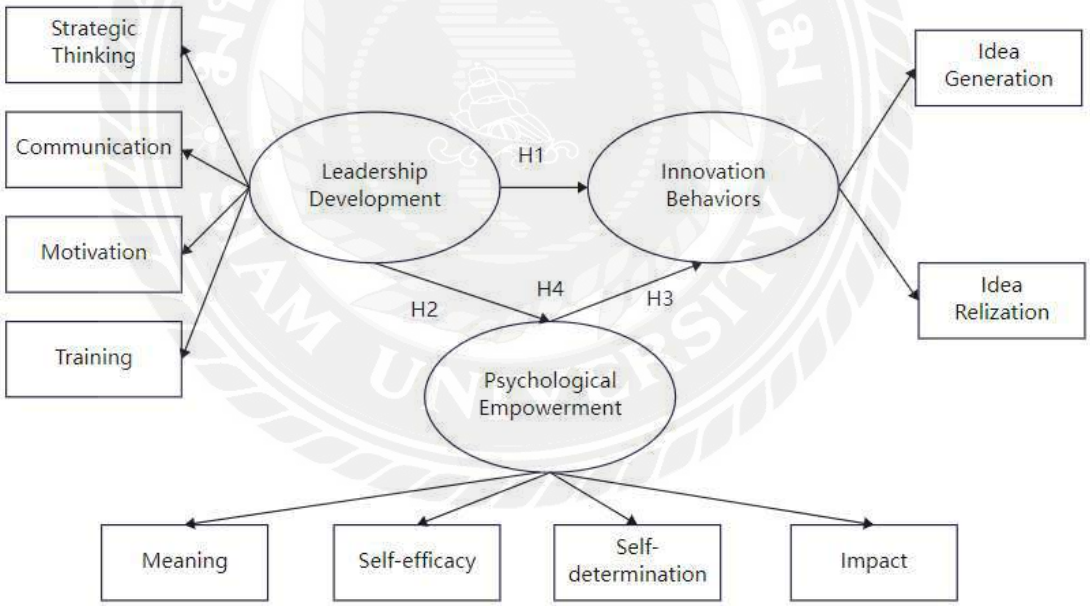
2. How does psychological empowerment mediate the relationship between leadership development and surgeons' innovation behavior in the hospital context of China?

1.4 Research Objectives

1. To determine the interconnections among leadership development, psychological empowerment, and innovation behaviors of Surgeons within the hospital settings in China.

2. To investigate the role of leadership development in surgeon innovation behavior in the context of hospitals in China.

1.5 Research Framework



1.6 Hypothesis

Hypothesis 1: Leadership Development has a direct effect on Surgeon Innovation Behaviors in hospitals in China.

Hypothesis 2: Leadership Development has a direct effect on Psychological Empowerment of surgeons in hospitals in China.

Hypothesis 3: Psychological Empowerment has a direct effect on Surgeon Innovation Behaviors in hospitals in China.

Hypothesis 4: Psychological Empowerment mediates the relationship between Leadership Development and Surgeon Innovation Behaviors in hospitals in China.

1.7 Scope of the Study

In this study, the scope was classified as follows:

1) Scope of Area

This study was limited to the hospitals in China.

2) Scope of Population

For quantitative research, the total population was 437,335 surgeons from hospitals in China (National Health Commission, 2022), and 450 questionnaires were sent out.

For qualitative research, eight surgeons, two hospital leaders, and two government officers from the Health Department were interviewed. The total was 12 interviewees.

3) Scope of Content

The theories and concepts related to this research included leadership development, innovation behaviors, and psychological empowerment.

4) Scope of Time

The research began in August 2024 and finished by June 2025.

1.8 Expected Results

1) The study enriches the research results of leadership development and innovation of Chinese surgeons and provides empirical research references for subsequent researchers.

2) This research provides a decision-making reference for Chinese hospital managers to improve the innovation ability of surgeons more effectively, promote management innovation, and enhance the competitiveness of hospitals in the medical field.

3) According to the results of this study, China's health administrative departments can provide relevant policy support for the leadership development of physicians, improve the leadership capacity of physicians, and promote the development of China's health cause.

1.9 Definition of Key Terms

Leadership Development means an ongoing process of enhancing surgeons' capabilities in strategic thinking, communication, and motivation through structured training and experience. It enables surgeons to effectively drive innovation in their practices.

A surgeon is a qualified physician trained to perform surgical procedures.

Surgeons' Innovation Behavior means the generation of ideas for adopting new technologies and methods by surgeons in the process of diagnosis and treatment, and the promotion of successful implementation of the innovation.

Psychological Empowerment is a psychological state reflecting an individual's sense of control and agency within their work role, encompassing four cognitions: meaning, self-efficacy, self-determination, and impact.

CHAPTER 2
LITERATURE REVIEW

The details in this chapter will be separated into 6 parts as follows:

2.1 Introduction

2.2 Theories and Concepts

2.3 Theories and Concepts Related to Leadership Development

2.4 Theories and Concepts Related to Innovation Behaviors

2.5 Theories and Concepts Related to Psychological Empowerment

2.6 Conceptual Framework, Operational Definition, Hypothesis, and Explanation of Hypothesis

2.1 Introduction

The present state of surgical care in China is confronted with numerous challenges, which encompass the disproportionate allocation of healthcare resources, disparate levels of technological advancement, and concerns regarding the quality and safety of surgical procedures (Jiang et al., 2021; Sun et al., 2021). For instance, in the smaller cities and townships of China, the standards and outcomes associated with surgical care are generally inferior compared to those found in larger urban centers and specialized medical institutions. Zhang, W. (2019) and Zeng et al. (2021) pointed out that the technical level and postoperative management of surgical procedures in China still have a large gap in international comparisons, especially in the application and promotion of innovative technologies. Enhancing surgeons' innovative capabilities has become an inevitable choice to improve the quality of medical care and patients' prognostic outcomes. The innovative conduct exhibited by surgeons is instrumental in catalyzing the progress of surgical methodologies, treatment modalities, and clinical practices, including the incorporation of novel technologies, the refinement of surgical protocols, and the development of interdisciplinary collaborative frameworks (Dedeilia et al., 2020). Nevertheless, there exists a notable scarcity of scholarly inquiry pertaining to the innovative conduct of

surgeons, and specifically, a comparative insufficiency of studies focused on the facilitation of such behavior through the advancement of leadership development. In the fast-changing medical environment, surgeons' innovativeness is not only related to individual career development but also directly affects the competitiveness and service quality of healthcare organizations (Liang et al., 2021).

According to organizational behavior theory and leadership theory, surgeons' innovation behaviors and attitudes are largely influenced by leadership development (Felipe et al., 2021). Through effective leadership development programs, surgeons' innovative potential can be stimulated, and a work environment that encourages innovation can be created, thus significantly contributing to surgeons' innovation behaviors. It has been demonstrated that the execution of a leadership development initiative exerts a significantly greater influence on the innovative conduct of personnel (Ajmal et al., 2024; Sohail, 2024). However, there are many theoretical studies on leadership development, but empirical studies are still insufficient(Day et al., 2021). Consequently, rigorous investigation into the particular aspects of leadership development that can efficaciously enhance the innovative behaviors of surgeons will not solely contribute to elevating the general standard of surgical care, but also furnish novel insights and empirical substantiation for the theoretical exploration of leadership within the medical domain, thereby facilitating the comprehensive optimization and advancement of surgical healthcare services.

2.2 Theories and Concepts

2.2.1 Transformational Leadership Theory

Although the notion of Transformational Leadership was initially presented by sociologist James V. Downton in 1973, the theoretical framework of transformational leadership as a pivotal paradigm of leadership was articulated by James Burns in his seminal work, On Leadership, published in 1973, wherein he conducted a comprehensive

analysis of political leadership and posited that leadership could be classified into Transactional Leadership and Transformational Leadership.

While Burns proposed the idea of transformational leadership, he did not provide an explicit definition. In 1980, Bernard Bass defined transformational leadership: "Transformational leadership is the process of making employees aware of the significance of the task they are undertaking, stimulating the higher needs of subordinates, building a climate of mutual trust, and motivating subordinates to sacrifice their interests for the good of the organization and to achieve results that exceed expectations". Bass elaborates on the distinct attributes of transformational leadership, indicating that such leaders possess the ability to maintain composure and exhibit a sense of humor during crises, as well as demonstrate patience and accountability in pivotal decision-making situations. Transformational leaders inspire their employees to go beyond self-interest and pursue higher collective achievement through a clear vision and strategic goals. This leadership paradigm is composed of four fundamental components, specifically idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration.

Transformational leaders prioritize the cultivation of creativity and innovation among their subordinates and advocate for an organizational culture that embraces innovation by endorsing autonomous thought processes and effective problem-solving methodologies. They provide clear direction and role models for team members by modeling ethical standards of excellence and behavior. Inspirational stimulation enables leaders to enhance employees' self-efficacy and motivation through strong vision and clear communication (Conger & Kanungo, 1988). In addition, the application of intellectually stimulating motivates employees to question the status quo and try new approaches, which is especially important in a rapidly changing and competitive market environment (Yukl, 2010). Personalized care, conversely, exemplifies a leader’s endorsement and comprehension of personnel by emphasizing unique requirements and offering tailored direction and assessment to improve employee contentment and organizational commitment (Bass, 1999).

This type of leadership is particularly suitable for transformational situations and innovation-driven industries such as technology, healthcare, and education. Through the provision of suitable support and resources, transformational leaders are capable of effectively galvanizing the latent potential of their employees and inspiring them to engage actively in the process of organizational change (Bass & Riggio, 2006). In addition to cultivating a cohesive and trust-based team dynamic, they also enhance the resilience and adaptability of the team, thereby positioning the organization to more effectively confront the challenges presented by the external environment. Leaders exemplifying this style typically exhibit a substantial degree of emotional intelligence and transformational intent, which equips them to adeptly manage team conflict, navigate change, and steer team members toward a unified objective (Goleman, 2000).

Empirical investigations have indicated that in recent years, the focus of scholarly inquiry into transformational leadership has transitioned toward the examination of the mediating and moderating variables that are associated with its operational mechanisms. The mediating roles of variables such as mental empowerment, team climate for innovation, trust, and leader-subordinate exchange have all been confirmed to varying degrees (Anderson, 2017). In particular, the implementation of transformational leadership within environments characterized by elevated degrees of innovativeness and uncertainty can facilitate the augmentation of employee innovativeness and conduct.

A core trait of transformational leadership is the ability to vision-shape. Through a clear vision, transformational leaders can motivate followers to work toward a collective goal (Maisyura et al., 2022). Transformational leaders are vision creators or co-creators. Imagining an optimistic trajectory for an organization serves as a fundamental element in the cultivation of a "catalytic" leader. A vision motivates followers to engage in the leadership process and achieve organizational goals enthusiastically. It creates a sense of shared identity (Kouzes & Posner, 2008). The cultivation of leadership capabilities can endow leaders with the proficiency to foresee forthcoming events, tackle obstacles, and discern potential opportunities by promoting strategic cognitive processes (McCauley & Palus, 2021). Meanwhile, transformational leadership emphasizes motivating followers

through inspirational communication, noting that effective communication is not just about delivering information, but about shaping trust, inspiring empathy, and building consensus (Rathod, 2022). To this end, in leadership development, skills training can help leaders better articulate goals, manage conflict, communicate organizational vision (Men et al., 2020), and enhance team cohesion and execution through transparent and trusting communication. In addition, transformational leadership emphasizes boosting team morale and motivation through intrinsic motivation (Aljumah, 2023). Bass and Riggio (2006) posit that transformational leaders exhibit the capacity to evoke the interest of their followers, formulate and galvanize a collective vision, encourage followers to actualize their potential, and incite followers to transcend their individual interests. This allows team members to work not just for rewards, but out of identification with the organization's vision and pursuit of self-actualization. In light of this, the advancement of leadership competencies significantly fosters employee dedication and the propensity for innovation by augmenting the leader's capacity to evoke intrinsic motivation within the team, thereby further reinforcing employee commitment and the drive to innovate.

In leadership development practice, many leadership development programs emphasize transformational leadership development to help managers lead organizational change in complex and rapidly changing environments. Ingleton(2013) takes transformational leadership as the theoretical basis to discuss the impact of leadership education on college students and establishes a formal leadership development plan for students on this basis, to make college students fully prepared for positive transformative leadership. Harvard Business School's Advanced Management Program (AMP) includes transformational leadership by focusing on strategic thinking, communication, and team motivation to equip leaders to drive organizational change (Harvard Business School, 2024). Cohrs et al. (2020) developed and evaluated a leadership development program focusing on transformational leadership and communication. The study found that participants in the experimental group showed significant improvements in transformational leadership behaviors, such as articulating vision and providing personalized support, compared to the control group, and communication skills,

particularly focused communication, also improved significantly after training. Akdere et al. (2019) based on the practice of studying leadership development in the IT industry environment, the research results showed that transformational leadership is very important for IT. Moreover, a comprehensive analysis conducted by McGowan et al. (2020) regarding leadership development among health and social care professionals revealed that transformational leadership cultivates behaviors including the facilitation of employee development, the encouragement of innovation, and the enhancement of commitment, which are all critical objectives that leadership development initiatives aim to foster. These programs often include experiential learning, coaching, and mentorship to reinforce transformational leadership qualities in healthcare professionals. The analysis posits that initiatives aimed at the cultivation of leadership skills, particularly those that integrate the tenets of transformational leadership, have the potential to augment leadership practices and bolster the participants' self-efficacy, analytical capabilities, and proficiency in executing organizational change effectively.

In summary, transformational leadership theory emphasizes that leaders drive organizational innovation and development through vision shaping, communication, motivation, and providing humane care for employees. These notions exhibit a high degree of alignment with the fundamental tenets of leadership development and establish a systematic theoretical framework for the advancement of leadership capabilities. The theory of transformational leadership offers a robust theoretical underpinning for the development of leadership skills among surgeons. In the execution of initiatives aimed at enhancing leadership capabilities for surgeons, team members are inspired to engage proactively in the process of transformation by honing their emotional intelligence, communication proficiencies, and motivational capacities to maintain a competitive advantage in a continuously evolving healthcare landscape. Surgeons are urged to maintain a competitive edge in the dynamic healthcare environment by refining their emotional intelligence, communication competencies, and motivational abilities in order to inspire team members to engage actively in the transformative process.

2.2.2 Leader-Member Exchange Theory

Leader-Member Exchange (LMX) theory, alternatively referred to as leader-member exchange theory, constitutes a leadership framework that emphasizes the significance of the relational dynamics between leaders and their subordinates. First proposed by Fred Dansereau, George Graen, and William J. Haga in 1975, the theory centers on the notion that leaders do not form the same "exchange relationships" with different subordinates, and that the quality of these relationships affects a variety of outcomes such as job satisfaction, performance, and organizational commitment (Graen & Uhl-Bien, 1995). The Leader-Member Exchange (LMX) theory delineates leader-member interactions into two distinct categories: "high-quality exchange relationships," which are predicated upon elements of trust, mutual respect, and reciprocity, thereby facilitating enhanced motivation and creativity, and "low-quality exchange relationships," which predominantly adhere to formal role expectations and are characterized by a deficiency in trust, respect, and reciprocity; the latter relationships are notably structured around rigid role delineations and are similarly defined by a scarcity of trust, respect, and reciprocity (Van Den Broeck et al., 2014). The former is based on trust, respect, and reciprocity and promotes employee motivation and creativity, while the latter tends to follow formalized roles and is colder and more transactional.

Since its introduction, LMX theory has undergone a progression from early role theory to later multidimensional models. Initial research focused on the "duality" of relationships - the contrast between high- and low-quality exchange relationships. Subsequently, scholars have expanded the theory to argue that the quality of leader-member relationships is a continuum rather than a simple dichotomy (Liden, Sparrow, & Wayne, 1997). In recent years, researchers have begun to focus on the dynamic developmental process and multiple dimensions of LMX theory, such as the leader-member relationship in cross-cultural contexts, the impact of LMX on team performance, and how to improve overall organizational effectiveness by improving LMX relationships (Premru et al., 2022).

LMX emphasizes trust and reciprocity between leaders and subordinates; trust facilitates information sharing and innovative thinking; reciprocity motivates subordinates to actively participate in decision-making; and ultimately, teamwork and collective intelligence are formed. Collectively, these elements empower leaders to engage in strategic cognition and enhance decision-making efficacy within intricate and dynamic contexts (Cortes & Herrmann, 2021). For this reason, strengthening strategic thinking in leadership development helps leaders to be able to better collaborate with core team members, brainstorm, and make subordinates more willing to make innovative strategic proposals and work together to formulate strategic goals, thus enhancing the organization's ability to think strategically.

LMX believes that the quality of relationships between leaders and different subordinates is multilevel and that communication is at the center of relationship quality improvement (Uhl-Bien et al., 2022). By cultivating a robust exchange relationship, leaders are positioned to facilitate more effective bidirectional communication with their subordinates, thereby enhancing the comprehension of subordinates' needs and perspectives and subsequently augmenting the efficacy of decision-making processes. This mode of communication not only aids leaders in acquiring a deeper understanding of the needs and anticipations of subordinates but also bolsters subordinates' sense of trust and reliance on the leader (Kaluza et al., 2021). In this process, leaders are able to give quick feedback and deal with problems, improving the accuracy and efficiency of decision-making. Therefore, strengthening communication skills in leadership development will help to enhance teamwork, reduce misunderstandings, and thus improve overall work efficiency and organizational performance.

Within the paradigm of Leader-Member Exchange (LMX) theory, the establishment of high-caliber relationships between leaders and their subordinates can substantially enhance the motivation and job satisfaction of subordinates (Nursetialloh, 2023). Through personalized incentives, leaders can meet the needs of different subordinates and enhance their intrinsic motivation (Sitthiwarongchai et al., 2020). In leadership development, enhancing leaders' motivation levels and strategies can lead to

better employee performance, promoting and thus increasing employees' motivation, and improving innovation.

In examining the impact of leadership development on surgeons' innovation behaviors, LMX theory provides an important perspective. First, cooperation and trust in surgical teams are critical to innovation, and high-quality LMX relationships enhance communication and collaboration among team members, facilitating innovative knowledge sharing and interdisciplinary collaboration. Second, surgeons' innovation behaviors require support and motivation from their leaders, and high-quality LMX relationships can increase physicians' job satisfaction and motivation, which in turn inspires them to propose and implement new treatments and technologies (Gumusluoglu & Ilsev, 2009). Therefore, by applying LMX theory, the leader-member relationship can be better understood and improved, thereby promoting innovation behaviors among surgeons and contributing to the overall quality of care and patient satisfaction.

2.2.3 Adult Learning Theory

Andragogy represents one of the pioneering theoretical frameworks that systematically investigates the distinctive attributes of adult learning processes. This conceptual framework was articulated by Malcolm Knowles during the 1970s and is essential for a comprehensive understanding of the dynamics of adult education. Knowles introduced this theory through his work "The Adult Learner: A Neglected Species" (1973), where he delineated the principles that distinguish adult learning from traditional child-focused education. Knowles posited that adult learners are inherently different from younger learners due to their accumulated life experiences, self-directed learning tendencies, and practical orientation. His theoretical construct underscored that adult motivation is primarily driven by intrinsic factors, including personal development and self-actualization, as opposed to extrinsic incentives or societal pressures. This perspective marked a significant shift from the traditional pedagogy, which primarily focused on the learning needs and methods suitable for children (Knowles, 1973).

Further elaborating on these ideas, Knowles published "Andragogy in Action" in 1984, where he refined his principles and provided practical applications for adult education. He delineated six fundamental principles: autonomous learning, the incorporation of prior experiences, the pertinence of educational content, a focus on problem-solving, intrinsic motivation, and the congruence of learning with individual needs and interests (Knowles, 1984). These principles emphasized the necessity of customizing educational experiences to suit the distinctive attributes of adult learners, including their desire for self-governance and the practical application of acquired knowledge. This approach transformed adult education by emphasizing the active participation of learners in their own learning process, which has since impacted fields such as corporate training, professional growth, and lifelong learning programs (Merriam & Baumgartner, 2021).

The theoretical framework of adult learning underscores the importance of self-directed learning, experiential learning, the transfer of knowledge to real-world applications, reflective practices and critical evaluation, collaborative learning modalities, and the pursuit of lifelong learning (Alam, 2022). Effective training programs not only concentrate on the technical competencies and expertise of leaders but also prioritize the enhancement of interpersonal skills, including emotional intelligence, communication proficiency, and teamwork capabilities among individuals (Wallace et al., 2021). Leadership development, on the other hand, emphasizes the process of enhancing individuals in terms of leadership competencies, skills, and qualities through systematic training and practice(Megheirkouni & Mejheirkouni, 2020). For this reason, the formulation of training programs predicated on these theoretical constructs that align more closely with the requirements of adult learners can not only augment the educational experience of leaders but also facilitate the advancement of their leadership competencies in practical settings, thereby ultimately elevating the collective leadership caliber of the organization.

In summary, in the development of leadership skills among surgeons, adult learning theory provides essential guidance for designing and implementing effective training

programs. Surgeons, who already possess substantial experience and knowledge in their field, require more autonomy in training to choose content and methods that best suit their needs. Additionally, their learning should be closely related to their clinical experience and daily work, using reflection and discussion to enhance learning outcomes. The training content must also have practical relevance and purpose, directly aligned with the professional needs and goals of surgeons, such as improving their communication skills, teamwork, and decision-making abilities through case analysis and practical exercises.

2.3 Theories and Concepts Related to Leadership Development

2.3.1 Meaning of Leadership Development

In the academic research field of leadership development, numerous scholars have proposed their respective definitions from different perspectives. Although these definitions vary, they fall into three broad categories.

Some scholars have focused on the essential characteristics and fundamental construction of leadership development. The conceptualization of leadership development is deemed to be profoundly influenced by empirical research foundations, theoretical frameworks, and academic emphasis (Day, 2000). The diversity of interpretations is also widely acknowledged in the literature (Avolio, 2005). Building on this, leadership development has been conceptualized as a multi-dimensional and multi-level construct, whose exact meaning depends on research perspectives and practical needs (Iles & Preece, 2006). This perspective emphasizes the complexity and contextual nature of leadership development, providing a theoretical foundation for subsequent studies. It emphasizes that the advancement of leadership capabilities is not a fixed or singular notion, but instead constitutes a dynamic and multifaceted process.

A second body of literature emphasizes the core processes and key skill development within leadership development. The advancement of leadership capabilities has been characterized as a systematic approach aimed at augmenting the competencies, understanding, and conduct of both individuals and collectives via educational

interventions, with a particular emphasis on developing proficiencies in areas such as strategic cognition, communicative effectiveness, and motivational dynamics (Day & Dragoni, 2015). It is also viewed as an ongoing developmental journey involving not only the ability to influence others but also the capacity to navigate complex organizational environments (Yukl, 2012). From an analogous standpoint, the process of leadership development is characterized as a methodical framework aimed at enhancing leadership competencies via educational initiatives, training programs, and experiential learning opportunities, emphasizing the importance of proficient communication, motivational techniques, and strategic cognitive processes (Northouse, 2021). In a meta-analytic review, Lacerenza et al. (2017) proposed that leadership development enhances individual, interpersonal, and organizational capabilities, including decision-making and strategic acumen. In the context of healthcare, the development of leadership is conceptualized as a systematic process designed to enhance fundamental competencies—such as technical proficiency, decision-making capabilities, communication skills, collaborative teamwork, and self-awareness—which are paramount to effective leadership and favorable organizational results (Wijnberge et al., 2020). These viewpoints collectively provide a comprehensive depiction of the developmental process and skill requirements associated with leadership development, offering practical guidance for leadership cultivation.

A third category of research explores the unique pathways and theoretical underpinnings of leadership development. Several academics emphasize the significance of experiential learning, introspection, and individual development in the enhancement of leadership capabilities (Bennis, 2009). This view is echoed in healthcare literature, where interdisciplinary leadership programs are shown to enable participants to immediately apply acquired skills (Sonnino, 2016). From a theoretical perspective, the principles of transformational leadership theory have significantly influenced the formulation of leadership development initiatives intended to augment competencies pertinent to motivation, communication, and organizational transformation (Bass & Avolio, 1994). Similarly, leadership development is conceptualized as expanding the ability to perform effectively in leadership roles, emphasizing direction-setting, alignment, and sustained

commitment through strategic thinking and interpersonal influence (McCauley & Van Velsor, 2004). Kouzes and Posner (2006) argued that leadership development involves cultivating the ability to inspire and guide others toward shared objectives, which can be achieved through targeted training. In practical applications, Olson (2013) developed a leadership development impact model based on a leadership practice checklist that identified nine contributing factors and demonstrated its effectiveness in medical training. This model has also been supported in the Chinese healthcare context (Wen & Ruan, 2008). In a more recent healthcare-focused study, McKimm et al. (2022) emphasized that leadership development must persist during crises, with attention to self-awareness, communication, team motivation, and adaptability. These contributions—ranging from developmental pathways (e.g., experiential learning and self-reflection), theoretical frameworks (e.g., transformational leadership), and practical models (e.g., healthcare leadership programs)—offer diverse and in-depth perspectives, thereby enriching the conceptual understanding and practical application of leadership development.

For the objectives of this research endeavor, leadership development is conceptualized as a continual progression aimed at augmenting the competencies of surgeons in areas such as strategic cognition, effective communication, and motivational skills through systematic training and experiential learning. It enables surgeons to effectively drive innovation in their practices.

Factors of leadership development / Authors (year)	Strategic thinking	Communication	Motivation	Training	Self-awareness	Team building	Supports others	Challenge the Process
McKimm et al. (2022)	✓	✓	✓	✓	✓			
Geerts et al. (2020)		✓	✓	✓	✓			✓
Day & Dragoni (2015)	✓	✓	✓	✓			✓	
Northouse, P. G. (2018)	✓	✓	✓					
Lacerenza et al. (2017)	✓	✓	✓	✓		✓		
Sonnino(2016)	✓	✓	✓	✓		✓		
Olson (2013)	✓	✓	✓	✓	✓			✓
Yukl, G. (2012)	✓	✓	✓	✓	✓			
Wen Maowei &Ruan Ping (2008)	✓	✓	✓	✓			✓	✓
Kouzes & Posner (2006)	✓	✓	✓	✓			✓	
McCauley & Van Velsor (2004)		✓	✓					
Total	9	11	11	9	4	2	3	3

Table 2.1

Crosscutting of Leadership Development

Source: Researcher (2024).

2.3.2 Theories and Concepts Related to Strategic Thinking

2.3.2.1 Definition of Strategic Thinking

Strategic thinking, recognized as a fundamental concept within the spheres of business and leadership, has been articulated from various scholarly viewpoints, underscoring its intricate and multifaceted character.

A prominent viewpoint conceptualizes strategic thinking as a form of cognitive synthesis. From this perspective, strategic thinking encompasses the amalgamation of innovative and analytical methodologies, empowering leaders to craft a prospective vision, execute well-informed decisions, and synchronize actions with overarching long-term objectives (Liedtka, 1998). It is further emphasized that strategic thinking is a synthesis of intuition and creativity, extending beyond linear analysis to help leaders anticipate future trends, grasp broader contexts, and stimulate innovation (Mintzberg, 1994). This integrative approach underscores the necessity for strategic thinkers to possess both imaginative foresight and rational judgment, as well as a holistic perspective essential for effective strategy formulation.

Another stream of research focuses on the role of strategic thinking within competitive environments. Strategic cognition, viewed through the lens of industry structure, is conceptualized as the methodology for ascertaining an organization's competitive stance (Porter, 1980). In this view, cultivating strategic thinking is essential for leaders to identify and sustain competitive advantages, which are critical for long-term organizational success. This perspective highlights the importance of analyzing market dynamics and competitor behavior when formulating strategic plans.

A third perspective emphasizes the problem-solving function of strategic thinking. Strategic cognition is conceptualized as the ability to grasp the intricacies of the commercial landscape and leverage this insight to formulate a coherent vision and strategic framework (Campbell & Alexander, 1997). This enables leaders to make informed decisions amid uncertainty, respond to environmental changes, and guide organizational direction. Similarly, strategic thinking is viewed as the ability to identify core issues, formulate and test solution hypotheses, and implement actions aligned with long-term objectives (Rumelt, 2011). Both perspectives stress the significance of strategic thinking in supporting complex decision-making and facilitating organizational transformation.

This research delineates strategic thinking as the surgeon's capacity to engage in comprehensive cognitive processes, comprehend the intricacies of healthcare dynamics,

establish long-term objectives, foresee evolving trends, and facilitate transformation within a complex and unpredictable healthcare landscape.

2.3.2.2 Theories and Concepts Related to Strategic Thinking

In the domain of strategic thinking research, a multitude of scholars have engaged in comprehensive investigations from various vantage points, and these scholarly contributions have significantly enhanced our comprehension of the diverse ramifications and utilizations of strategic thinking. Specifically, the pertinent research can be broadly categorized into the subsequent three dimensions:

On one side, a segment of scholarly research emphasizes the relationship between strategic cognition and organizational performance. Empirical investigations have revealed that, via the intermediary function of dynamic capabilities, leaders who exhibit robust strategic cognition are more adept at facilitating innovation within business models (Li, J. et al., 2021). Concurrently, the construct of strategic cognition and its constituent dimensions exert a significant influence on innovation efficacy. Findings from pertinent studies suggest that the three dimensions of strategic cognition—namely, systems thinking, divergent thinking, and reflective thinking—positively correlate with innovation efficacy (Olaleye et al., 2020).

Conversely, a segment of scholarly inquiry emphasizes the interplay between strategic cognition and the evolution of leadership capabilities. Strategic thinking is regarded as an important component of leadership, which can help leaders build a systematic perspective, enhance their forward-looking ability, and cope with complex changes (Georgakalou et al., 2023). Studies also point out that strategic thinking has the functions of envisioning the future and adapting to environmental changes, and it is an important characteristic of leadership capabilities that differentiates leaders (Piórkowska et al., 2021). In the leadership development within the public sector, the integration of strategic thinking contributes to improving the quality of decision-making, enhancing organizational adaptability, and driving change (Virtanen & Tammeaid, 2020).

Furthermore, within the domain of strategic health leadership research, strategic thinking is regarded as the fundamental mechanism that facilitates the augmentation of leaders' visionary acumen, decision-making proficiency, and innovative capacities (Anderson et al., 2020).

Other research focuses on the application of strategic thinking in specific industry contexts. Studies have indicated that in the agricultural sector, industry-oriented training is crucial for cultivating strategic decision-making capabilities and forward-looking leadership. Consequently, the capacity for strategic thought has emerged as a pivotal criterion for the advancement of leadership within this domain (Perez, 2022). Additionally, although not specifically targeting the specific application of strategic thinking in the industry, research has shown that the enhancement of leadership skills such as strategic thinking has a positive impact on the development of agile leadership, the improvement of employees' innovation behaviors, and psychological empowerment (Bayram & Öztırak, 2023).

In conclusion, the above research literature suggests that leaders with strategic thinking can effectively respond to complex and dynamic environments and enhance organizational competitiveness by promoting innovation and dynamic capabilities. The empirical investigation indicates that strategic cognition not only facilitates the formulation and execution of effective business models but also serves a pivotal function in the processes of organizational learning and capability enhancement. Through the cultivation of strategic cognition, leaders are empowered to augment decision-making competencies and propel organizational innovation, consequently leading to improved overall performance metrics. Strategic cognition is thus regarded as an essential component of contemporary leadership development, furnishing critical assistance for organizations to secure a competitive advantage amid uncertainty.

2.3.3 Theories and Concepts Related to Communication

2.3.3.1 Definition of Communication

The phenomenon of communication has been extensively acknowledged as an essential element of proficient leadership, which incorporates not only the dissemination of information but also the development of interpersonal relationships. It functions not only as a medium for conveying messages but also as a strategic mechanism for engaging teams, fostering collaboration, and driving organizational performance (Hackman & Johnson, 2021; Zenger & Folkman, 2019).

From an information-transfer perspective, communication involves the exchange of information through sharing ideas, receiving feedback, and understanding others' viewpoints. Effective communication in this context requires more than clarity of message delivery—it also demands the ability to motivate teams and build productive relationships within and beyond the organization. Scholars emphasize that successful leadership communication integrates active listening, emotional intelligence, and team-building skills alongside fundamental message transmission (Hackman & Johnson, 2021; Zenger & Folkman, 2019).

Elaborating on this notion, communication is progressively perceived as a fluid, process-driven endeavor rather than a singular occurrence. It enables leaders to articulate a shared vision, address organizational challenges, and enhance performance outcomes through sustained interpersonal engagement (Northouse, 2018). From this perspective, communication serves as a foundational element of leadership practice.

Furthermore, emotional intelligence plays a vital role in shaping how leaders communicate. Goleman (2016) argues that leadership communication is deeply intertwined with self-awareness, empathy, and social skills. This broader understanding extends communication beyond verbal exchanges to include emotional regulation and relationship management, both of which are essential for navigating complex organizational contexts.

In line with this view, Bryman (2020) conceptualizes communication as a continuous process through which leaders build trust, promote employee motivation, and

strengthen interpersonal bonds. He emphasizes that strong communication capabilities not only facilitate effective information flow but also enhance team morale and productivity, thereby contributing to leadership effectiveness across diverse organizational settings.

In conclusion, based on the above definitions, this study considers communication as the process of surgeons to convey information, listen to feedback, and build relationships to enhance interactions within and outside the hospital.

2.3.3.2 Theories and Concepts Related to Communication

An expanding corpus of empirical studies has underscored the pivotal function of communication in augmenting organizational innovation, leadership efficacy, and employee conduct across diverse contexts.

Effective communication by top management has been shown to significantly influence open innovation outcomes. Empirical research indicates that when organizational executives partake in forthright and transparent internal discourse, employees are more inclined to ascribe heightened legitimacy to innovation endeavors. This perception, in turn, contributes to the success of project-level open innovation efforts. The study, which involved 200 open innovation managers, emphasized that enterprise-level communication led by top executives is an essential enabler of successful innovation outcomes (Wang et al., 2023).

Organizational communication practices at both supervisory and senior levels have also been found to facilitate a more symmetrical internal communication environment. This phenomenon subsequently motivates employees to proactively pursue feedback, thus augmenting their creative capacities. A quantitative investigation predicated on the responses of 405 full-time employees demonstrated that leadership communication exerts a positive influence on the quality of internal communication, and that the behavior of seeking feedback serves as a mediating factor in fostering innovation-related outcomes (Lee & Kim, 2021).

In virtual team settings, communication effectiveness remains vital. Research utilizing survey methodologies, conducted within a human resource outsourcing organization, revealed that team members who regard their leaders as proficient communicators exhibit elevated levels of team performance. Moreover, trust serves as a critical moderator that strengthens the link between leader communication and performance outcomes. These results underscore the significance of both technological and interpersonal dimensions of communication within remote work settings (Newman et al., 2020).

Communication has been recognized as a fundamental element of transformational leadership. Empirical case study investigations reveal that leaders who articulate their vision with clarity and authenticity are significantly more inclined to inspire their teams and foster effective organizational change. The findings reinforce the idea that transformational leadership outcomes are deeply intertwined with the leader's communication ability (Thompson & Miller, 2023).

Another line of research points to the relationship between communication visibility and employees' innovation behavior. When the transparency of communication within an organization is enhanced, there exists a greater propensity for employees to partake in innovative endeavors. Furthermore, this relationship is amplified in contexts where promotional supervisory focus is strong, suggesting that managerial emphasis on advancement opportunities can strengthen the innovation effects of transparent communication (Liang et al., 2022).

In summary, within an increasingly intricate organizational milieu, leaders possessing adept communication skills are capable of proficiently disseminating information, inspiring teams, and mediating conflicts within the organization, thereby augmenting the efficacy of leadership. Communication not only facilitates the enhancement of teamwork and satisfaction but also assumes a pivotal role in the execution of leadership strategies and the facilitation of organizational transformation. Through the cultivation and refinement of communication abilities, leaders can amplify their own

influence and the collective performance of the organization, thereby advancing leadership development.

2.3.4 Theories and Concepts Related to Motivation

2.3.4.1 Definition of Motivation

Motivation has historically been considered an essential construct within the domain of organizational and management studies, with researchers proposing diverse theoretical frameworks to elucidate its mechanisms and impact on employee behavior and performance.

A foundational view is presented in Herzberg's two-factor theory, which identifies motivation as a set of intrinsic factors such as achievement, recognition, and the nature of the work itself. These factors are seen as distinct from hygiene elements like salary or job security. According to this theoretical framework, motivational elements serve as the primary catalysts of job satisfaction and exert a direct influence on the augmentation of employee performance (Herzberg, 1959).

From a cognitive perspective, motivation can also be understood through expectancy theory. Vroom posited that individuals exhibit motivation when they perceive a correlation between their exertions and the attainment of preferred results, and that these results possess significance for them. This model suggests that the perceived relationship between effort, performance, and reward is central to explaining motivational dynamics in the workplace (Vroom, 1964).

Goal-setting theory offers another lens, positing that the specificity and difficulty of goals significantly influence employee motivation and task performance. When employees are presented with clear and challenging objectives, their motivational levels are heightened as they strive to meet these defined targets (Locke & Latham, 2002).

A more sophisticated conceptual framework is presented by self-determination theory, which underscores both intrinsic and extrinsic dimensions of motivation. This theoretical perspective elucidates that motivation is not merely influenced by external

incentives, but is also significantly affected by the fulfillment of fundamental psychological needs such as autonomy, competence, and relatedness. It posits that enduring motivation is preserved when individuals perceive a sense of internal satisfaction and personal development (Deci & Ryan, 2000).

Other scholars have emphasized the psychological and directional aspects of motivation. It is described as a dynamic internal process that energizes and guides behavior toward the achievement of goals. This process is shaped by both individual needs and external forces operating within the organizational environment (Marinak & Gambrell, 2008).

Furthermore, satisfying employees' intrinsic needs while also offering external incentives has been found to enhance motivation and productivity. Recognition, a sense of accomplishment, and opportunities for career advancement are commonly cited as influential factors that promote workplace motivation and engagement (Kovach, 1987).

In summary, the extant literature consistently converges on the notion that motivation constitutes a multi-faceted construct, which integrates both intrinsic and extrinsic factors, and that it serves a crucial function in influencing employee attitudes, exertion, and performance within organizational contexts. In conclusion, this investigation conceptualizes motivation as the surgeon's capacity to establish specific and challenging objectives in the realm of team management, while simultaneously augmenting the motivation of team members by addressing their intrinsic needs and offering extrinsic incentives.

2.3.4.2 Theories and Concepts Related to Motivation

Empirical investigations have consistently illustrated that motivational factors occupy a pivotal position in augmenting employee engagement, fostering innovation, and facilitating leadership development within various organizational contexts. A particular line of inquiry has concentrated on the diverse leadership styles and their potential to affect motivational levels. For example, transformational leadership has been empirically shown

to markedly enhance employee motivation by articulating a compelling vision, delineating clear direction, and empowering individuals within their respective roles. These motivational mechanisms not only strengthen employees' sense of purpose but also contribute to their overall work enthusiasm and productivity (Yusup & Maulani, 2023).

In the realm of team dynamics, the concept of shared leadership has been recognized as a significant catalyst for augmenting both motivation and collaboration among team members. By implementing motivational strategies such as empowerment and knowledge sharing, leaders can elevate intrinsic motivation, foster greater engagement, and cultivate leadership capacity within teams, ultimately boosting organizational performance (Hoch & Dulebohn, 2017).

Motivation is further linked to innovation behavior. Empirical studies have demonstrated that participatory decision-making and employee motivation constitute critical precursors to eco-innovation, indicating that when employees perceive themselves as motivated and engaged in decision-making processes, their capacity for innovation is significantly augmented (Qalati et al., 2023). Similarly, an empirical study conducted among technical employees in multinational enterprises found that multiple dimensions of motivational factors—including intrinsic rewards and opportunities for recognition—positively correlate with innovation behaviors in the workplace (Baihao et al., 2015).

In the realm of leadership development, intrinsic motivation has been recognized as a fundamental catalyst for personal and professional growth. It promotes the adoption of a learning-centric orientation, facilitates deeper engagement with developmental opportunities, and enhances self-efficacy, all of which are essential for the cultivation of effective leaders (Gerstner et al., 2019).

Supplementary evidence underscores the significance of transformational leadership in incentivizing employees to participate in the processes of organizational decision-making. This inclusive approach not only boosts motivation but also enhances leadership potential by fostering trust and offering psychological incentives that promote positive organizational behaviors (Duan et al., 2020).

In conclusion, motivation is an important aspect of leadership development. Motivational leaders significantly augment employees' self-efficacy, creativity, and organizational commitment through the facilitation of intrinsic motivation, delegation of authority, and empowerment, consequently advancing the overall development of leadership competencies. The motivational strategies employed by leaders are efficacious in elevating employee motivation and engagement, thereby fostering organizational innovation and the dissemination of knowledge. In addition, motivation influences leadership effectiveness across cultures and contexts through moderating factors (e.g., power distance and work environment). Therefore, motivation is seen as a core factor in shaping and enhancing leadership behaviors, and in facilitating the growth and development of leaders to create higher performance and maintain competitiveness for organizations and teams.

2.3.5 Theories and Concepts Related to Training

2.3.5.1 Definition of Training

Training is commonly perceived as a methodical and organized strategy aimed at augmenting employees' competencies in terms of knowledge, skills, and attitudes, which ultimately facilitates the enhancement of both individual and organizational performance. It is typically planned with the intention of addressing performance gaps and preparing employees to meet evolving job demands. Scholars underscore its role in strengthening task execution across multiple organizational levels. For example, training is often characterized as a deliberately designed process that ensures employees can effectively perform their roles within teams and within the broader organization (Goldstein & Ford, 2002; Blanchard & Thacker, 2023).

In this context, training is not merely a knowledge transmission mechanism but also a purposeful learning experience that aligns with specific tasks or job requirements. The goal-oriented nature of training is highlighted through its emphasis on practical application and operational relevance (Armstrong, 2014; Buckley & Caple, 2009).

Beyond improving technical competence, training is widely recognized as a tool for shaping workplace behaviors and aligning employee performance with strategic organizational goals. It supports the acquisition of essential competencies while facilitating behavioral change that is congruent with company objectives (Noe, 2017; Kirkpatrick, 1998). Moreover, effective training initiatives have been shown to modify not only skills but also attitudes and motivation, which are critical for sustained job performance (Salas et al., 2012; Schuler & Jackson, 1987).

From a developmental perspective, training also plays a pivotal role in fostering personal growth and supporting long-term career progression. It encompasses structured activities that enable employees to internalize new knowledge and behaviors relevant to both current roles and future opportunities (Gagné, 1985). In addition, it contributes to holistic human resource development by promoting long-term learning outcomes beyond immediate job performance (Aguinis & Kraiger, 2009).

In summary, surgical training refers to the process by which surgeons enhance their managerial and clinical competencies through participation in a variety of leadership development programs, surgical skills training, simulated surgery, and reflective learning. This includes developing competencies in areas such as team management, strategic decision-making, and communication, alongside their surgical expertise. The instructional regimen encompasses a diverse array of undertakings, including leadership seminars, mentorship initiatives, and cooperative endeavors, designed to furnish surgeons with the requisite competencies to lead proficiently and enhance the efficacy of their medical teams and healthcare institutions.

2.3.5.2 Theories and Concepts Related to Training

Training is widely recognized as a foundational element of leadership development, particularly in healthcare and organizational settings. Effective leadership training is often characterized by its integration of theoretical content with real-world application. For instance, successful programs are typically embedded within individual or institutional projects to facilitate practical learning and ensure relevance to organizational contexts

(Sonnino, 2016). An expanding corpus of empirical evidence has illustrated that meticulously designed training initiatives can significantly improve leadership capabilities and organizational effectiveness. For example, training that is systematically designed and rigorously delivered has been shown to improve not only individual leadership skills but also team and institutional effectiveness (Lacerenza et al., 2017).

Similarly, scholars emphasize that leadership development through training is central to achieving both personal growth and broader organizational goals. Training programs can help leaders build essential competencies that contribute to long-term success (Van Velsor & McCauley, 2016). One innovative method gaining attention is group coaching, which has proven effective in cultivating self-awareness, emotional intelligence, and collaborative capacities—key attributes of effective leaders (Mbokota & Reid, 2022). In this context, the significance of methodical assessment is likewise acknowledged; it is imperative that leadership training be evaluated across various strata to ascertain its efficacy and facilitate ongoing enhancement (Kirkpatrick & Kirkpatrick, 2016).

Beyond general training models, scholars have increasingly focused on the impact of tailored approaches in leadership development. Training initiatives that are customized to meet specific organizational contexts or strategic needs tend to yield stronger leadership outcomes. Tailored programs, for example, are associated with heightened leadership effectiveness and improved organizational results (Lemoine, Kim, & Gaddis, 2019). Furthermore, the incorporation of executive coaching within leadership development paradigms has demonstrated a significant enhancement in the speed of leadership competency attainment and advancement in professional trajectories (Gentry et al., 2020). In parallel, targeted development initiatives focusing on entrepreneurial competencies have emerged as vital tools for fostering innovation and navigating complexity in dynamic environments. Such programs enhance entrepreneurial leadership and support long-term organizational growth (Kraus & Beckmann, 2022).

In summary, effective training is crucial for enhancing leadership development and effectiveness. Extensive research underscores the necessity of well-structured, practical, and evaluative training approaches to foster leadership capabilities and achieve

organizational success. Studies highlight the significance of tailored and comprehensive training methods, including executive coaching and entrepreneurial skill development, in improving leadership effectiveness. They emphasize the importance of integrating diverse leadership theories, personalizing coaching, and customizing training programs to fit organizational contexts. Such training initiatives foster the advancement of leadership competencies, enhance performance metrics, and elevate organizational achievement. Nevertheless, additional scholarly inquiry is imperative to investigate the interplay between diverse training methodologies and contextual variables to maximize the efficacy of leadership development.

2.3.6 The Influence of Leadership Development on Psychological Empowerment and Innovation Behaviors

2.3.6.1 The Influence of Leadership Development on Psychological Empowerment

Leadership development endeavors to augment the competencies, behaviors, and cognitive frameworks of leaders, and such transformations may directly or indirectly bolster employees' perception of psychological empowerment.

Strategic thinking has the potential to significantly augment the psychological empowerment of employees through the enhancement of their sense of purpose, autonomy, and competence, as well as the facilitation of effective communication and feedback mechanisms. An empirical study involving 239 healthcare workers explored the mediating role of leaders' strategic thinking skills in the relationship between empowered leadership and work engagement, and found that strategic thinking skills influence psychological empowerment by increasing employees' sense of mission (Abbas & Khal, 2016). In a study conducted in Polish public health care units at all organizational levels, researchers found that when the direction of the hospital was clarified through strategic thinking, employees felt empowered with greater autonomy and experienced an increased sense of psychological empowerment (Małys & Deszczyński, 2020).

Empirical investigations have persistently illustrated a robust correlation between the communicative competencies of leaders and the psychological empowerment of employees. An empirical study exploring the relationship between communication skills and the mental health and job empowerment of Bank Melli employees in Bandar Abbas found that communication skills help leaders build stronger trusting relationships and foster an open communication environment in their interactions with employees, and that there is a significant correlation between psychological empowerment and communication skills (Saira et al., 2021). An additional empirical investigation revealed that the communicative competencies of administrators exert a substantial influence on the psychological empowerment of educators, thereby underscoring the critical role of proficient communication within leadership frameworks (Reza, 2016). Similarly, a study on the relationship between self-esteem, psychological empowerment, leadership empowerment behaviors, and workplace assertiveness among medical staff showed that leaders with strong communication skills can enhance the psychological empowerment of medical personnel (Zhong, 2024).

Motivation can be classified into two categories: material incentives and non-material incentives (Feng, 2021), both of which serve to augment psychological empowerment through the enhancement of employees' self-efficacy and their perceived influence on work-related outcomes. A study found that the fair distribution of material rewards and clear performance standards significantly increased employees' sense of meaning in their work and their perceived impact on work outcomes (Khan et al., 2023). A research investigation exploring the correlation between authoritative leadership and safety behaviors, with psychological empowerment serving as a mediating variable, determined that non-material incentives have the potential to augment employees' psychological empowerment (Wang et al., 2022). Additionally, another investigation assessed the function of organizational commitment as a mediating factor in the influence of psychological empowerment on organizational citizenship behavior, indicating that non-material rewards exert a significant impact on employees' psychological empowerment. Specifically, the findings showed that non-material rewards increased employees'

psychological empowerment, which in turn enhanced organizational commitment, ultimately leading to greater organizational citizenship behavior (Fernando Coopertino et al., 2021).

In the research field of the relationship between training and employees' psychological empowerment, scholars have conducted discussions from multiple perspectives, and the relevant findings have enriched the theoretical understanding of this topic. Some studies have pointed out that training can enhance employees' psychological empowerment through various paths. This includes improving leaders' empowerment capabilities and facilitating their mastery of diverse leadership styles, enabling them to implement empowerment behaviors more effectively and grant employees more decision-making power and responsibility. Such a transformation not only enhances employees' autonomy but also improves their sense of control over their work (Zhang et al., 2022). There are also studies exploring the role of specific types of training, such as resilience training, in promoting psychological empowerment and supporting leadership development. Using a quasi-experimental design and through comparative evaluations before and after the intervention, relevant research has found that resilience training significantly enhances the psychological empowerment level of ICU nurses. This type of training helps to strengthen key leadership qualities such as confidence, indicating that training holds great value in enhancing the sense of empowerment and promoting leadership growth (Hezaveh et al., 2020).

Furthermore, certain investigations concentrate on the dynamic interconnections among various leadership styles, the construct of psychological empowerment, and organizational variables. Empirical evidence has indicated that psychological empowerment serves as a pivotal mediating factor in the relationship between transformational leadership and employees' turnover experiences, implying that the perception of empowerment holds substantial importance in shaping employees' organizational experiences (Schermuly and Meyer, 2020). Further research shows that empowering, transformational, and servant leadership styles contribute to psychological empowerment almost equally, reflecting the general "empowerment effect" of different

leadership styles (Schermuly et al., 2022). Moreover, research also indicates that the lack of status and power in the organization prompts nurses and nurse leaders to seek leadership education to gain higher influence and empowerment levels, thereby improving organizational performance (Terkamo-Moisio et al., 2022). This type of research deepens our understanding of the mechanism of psychological empowerment between the organizational power structure and employees' development needs.

2.3.6.2 The Influence of Leadership Development on Innovation Behavior

Employees equipped with strategic thinking capabilities are better able to understand and adapt to complex and ever-changing environments, thereby stimulating and supporting their innovation behaviors. Research has demonstrated that strategic thinking plays a significant role in propelling employees' innovation behaviors. For instance, in studies exploring the impact of strategic thinking on innovation behaviors, some scholars have pointed out that entrepreneurs' strategic thinking influences the direction and path of innovation behaviors (Chen & Song, 2021). Moreover, the cultivation of strategic thought significantly augments the capacity of leaders to recognize and exploit novel opportunities, thereby facilitating the formulation of anticipatory decisions within a swiftly evolving context (Goldman & Scott, 2016). Quantitative research from an organizational perspective has also revealed that employees' strategic thinking has a significant impact on their innovation behaviors (Gross, 2017). Meanwhile, certain research has found that strategic thinking promotes employees' innovation behaviors by enhancing their creativity and cognitive flexibility (Huang et al., 2019). Similar findings have also emerged in research within the field of sports management, where the strategic thinking of senior management personnel significantly influences employees' innovation behaviors as well (Nazari & Rafeei, 2023).

Communication can effectively stimulate employees' innovation behaviors by improving information flow, strengthening teamwork, promoting knowledge sharing, and creating a work environment that supports innovation (Nurhidayati & Sabrina, 2023). A sound communication mechanism enables employees to more easily share, receive, and

understand the information and knowledge held by each other, thus contributing to the emergence of innovation behaviors. In a study on front-line government agency employees in Sulu Province, Philippines, it was found that leaders with basic management skills such as strategic planning, motivation, human development, team building, and communication can effectively promote employees' innovation behaviors (Tagayan, 2023). Among employees in the high-tech industry in China, both organizational culture and informal organizational communication have a direct impact on employees' innovation behaviors (Chu & Guo, 2023). The research by Carmeli et al. (2011) also revealed that a positive organizational culture and effective communication channels contribute to inspiring employees' creativity, knowledge sharing, and idea generation. Moreover, transformational leaders can influence employees' innovative work behaviors in multiple ways by enhancing communication to promote knowledge sharing (Sangperm & Chienwattanasook, 2019).

Motivation serves as a critical determinant in the innovative behaviors exhibited by employees (Ryan & Deci, 2000). The dynamic componential model proposed by Amabile and Pratt (2016) emphasizes the central position of intrinsic motivation in the innovation process. Research shows that intrinsic motivation can prompt employees to engage more deeply in creative work and actively seek innovation opportunities. Grant and Berry (2011) further point out that intrinsic motivation and prosocial motivation (such as the desire to help others) jointly contribute to the formation of creative behaviors. This effect is particularly significant when employees can integrate their motivations with organizational goals. In the context of manufacturing enterprises, the implementation of green development strategies has a significant impact on employees' green innovation behaviors, and the intensity of motivation significantly affects the performance of green innovation behaviors (Li et al., 2024). Another empirical study has found that incentives through training and development are the most facilitative factors, followed by top-level support and motivation stimulation (Ko, 2015).

The process of training is instrumental in augmenting organizational efficacy and cultivating an environment conducive to innovation by refining leadership competencies, advancing communicative abilities, and promoting innovative cognitive processes among

both managerial personnel and staff members. Mittal and Dhar (2015) found that leadership training enhanced leaders' support for their employees, which in turn encouraged employees to explore new approaches and propose innovative ideas. Furthermore, leadership training programs often include innovation management techniques and tools, which further stimulate the development of innovation behaviors among employees. Wang and Rode (2017) demonstrated that leaders who underwent leadership training were more likely to employ structured innovation tools, thus facilitating innovation within their teams. Jalil et al. (2021) employed structural equation modeling on a cohort of 635 employees hailing from 200 Malaysian small and medium-sized enterprises, thereby affirming that employees' perceptions regarding training exerted a significant influence on their innovative behavior. Additionally, Marouf Abdelhamid Amr et al. (2023) conducted an empirical study on the impact of an agile leadership training program for nurse leaders and their assistants at a university hospital, revealing a positive relationship between leadership training and innovation behavior. These findings align with the broader body of research, indicating that leadership training, by enhancing leadership competencies and promoting innovative thinking, effectively fosters employees' innovation behaviors (Marouf Abdelhamid Amr et al., 2023; Park & Jo, 2018; Schermuly et al., 2013).

In summary, strategic thinking helps leaders to set visionary goals; communication skills enhance the effectiveness of information transfer and feedback; incentives drive employees to actively participate in innovation; and training improves overall leadership quality. These dimensions collaboratively function to establish a conducive atmosphere that fosters employees' creative capabilities and practical competencies, consequently enhancing the overarching innovation performance of the organization.

2.4 Theories and Concepts Related to Innovation Behaviors

2.4.1 Individual Innovation Behavior Model

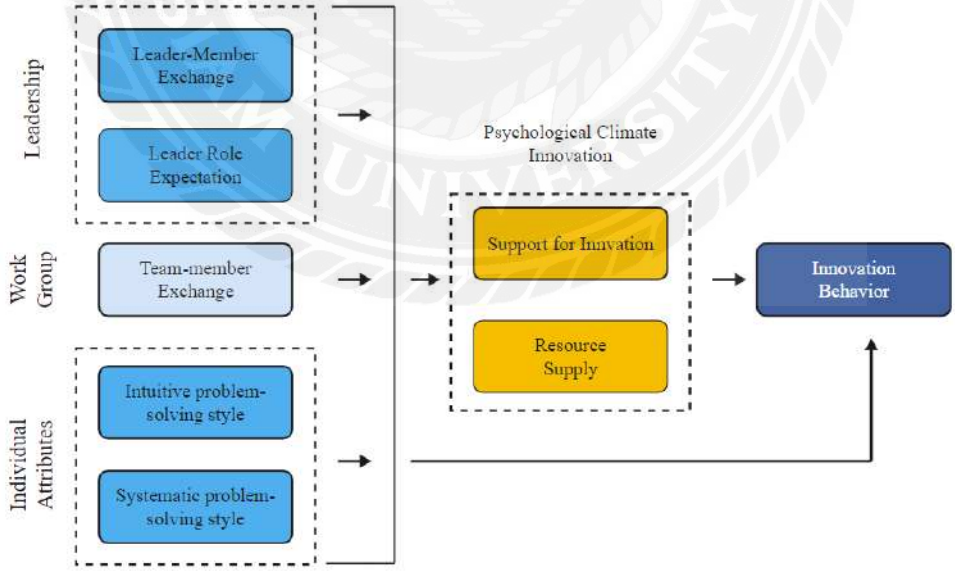
In the year 1994, Scott and Bruce synthesized the determinants influencing individual innovation behavior and introduced a theoretical framework of individual

innovation behavior through the lens of interaction, which posits that an individual's innovative actions emerge from the interplay of four systemic elements: the individual, the leader, the work team, and the innovation climate (Scott & Bruce, 1994), as depicted in Figure 2.1. The empirical study revealed that leadership-member exchange, leadership role expectations, and innovation support significantly and positively affected innovation behavior. Conversely, the systematic problem-solving style had a significant negative impact. Team-member exchange and resource availability had no effect. Notably, only innovation support mediated the relationship between leadership-member exchange and innovation behavior.

This model provides an important theoretical reference for subsequent scholars' research. This study will apply this theory as the theoretical basis for studying surgeons' innovation behavior. The surgeon's innovation behavior is divided into two dimensions: idea generation and idea realization.

Figure 2.1

Innovation Behavior Model



Source: Scott, S. G., & Bruce, R. A. (1994)

2.4.2 Creativity and Innovation Behavior

Creativity serves as a foundational precursor to innovation behavior; although the two are closely related, they remain conceptually distinct. In the paradigm of innovation, creativity is frequently perceived as the fundamental catalyst, characterized as the capacity of individuals or collectives to conceive ideas that are simultaneously original and contextually relevant, manifesting the traits of divergent thinking and exploratory problem-solving (Guilford, 1950; Amabile, 1996). The expression of creativity depends on domain-specific knowledge, creative thinking skills, and task motivation, all of which interact to foster the emergence and development of innovation behavior (Amabile, 1996). Within the broader innovation trajectory, creativity marks the idea generation phase, while innovation behavior reflects the implementation of these ideas, transforming concepts into tangible actions (Van de Ven, 1986). Thus, creativity not only provides the cognitive foundation for innovation but also acts as a psychological driver that propels individuals toward actual innovative engagement.

The successful translation of creativity into innovation behavior is influenced by multiple factors. Initially, personal determinants, including cognitive capacity, personality characteristics, and intrinsic motivation, significantly influence the facilitation of creativity. High levels of intrinsic motivation and autonomy are particularly conducive to generating creative ideas; however, these ideas are not necessarily adopted or applied directly (Amabile, 1996; Anderson, Potočnik, & Zhou, 2014). Second, team and organizational support are critical for the realization of innovation behavior, especially in complex technological or social contexts where individual creativity alone is insufficient. Leadership styles, organizational culture, and resource allocation are pivotal in facilitating innovation (Scott & Bruce, 1994; Akram, et al., 2020). Additionally, environmental and cultural influences cannot be overlooked. The proclivity for innovative behavior is significantly influenced by external determinants, including competitive market dynamics, governmental policy incentives, and the prevailing cultural milieu. The expression and pathway of creativity and innovation behavior may vary across cultural settings. For instance, high power distance cultures may restrict the expression of individual creativity,

whereas collectivist cultures may enhance team innovation performance (Hofstede, 1980; Shane, 1992; Li, Zheng, & Zheng, 2021).

In conclusion, creativity encompasses the identification and formulation of concepts or resolutions that are innovative, distinctive, and hold the potential for practical significance. This stage relies heavily on an individual's cognitive abilities, knowledge base, and experience. The transformation of individual creativity into innovation behavior is not easy and requires constant experimentation and breaking out of the box to realize its value (March, 1991). Innovation behavior, on the other hand, involves not only generating creative ideas but also transforming them into implementable products, services, processes, or management models (Scott & Bruce,1994; Janssen,2000; Marion & Fixson, 2021). The innovation implementation phase requires not only continued stimulation of creative thinking but also involves elements of resource deployment, organizational support, and teamwork (Somech & Drach-Zahavy, 2013; Tang et al., 2020).

2.4.3 Meaning of Surgeon Innovation Behaviors

Innovation behavior has been conceptualized in various ways, reflecting scholars' diverse emphases on novelty, usefulness, and process. It is often viewed as a set of cognitive and behavioral actions aimed at producing novel and valuable outcomes in organizational contexts (Amabile, 1988). These outcomes may include new products, services, technologies, or managerial practices, with novelty and utility considered as essential dimensions.

Some researchers define innovation behavior as activities that improve work products, processes, or methods, highlighting the transformative nature of innovation without necessarily framing it as a multidimensional construct (West & Farr, 1990). In workplace contexts, it commonly refers to generating, promoting, and applying creative and practical ideas to solve problems or improve efficiency (Shalley et al., 2004). Other definitions focus on the social nature of innovation, where new ideas are generated and translated into outcomes through communication and interaction (Woodman et al., 1993).

A widely accepted model views innovation behavior as a multistage process that involves distinct but interrelated actions. This model includes stages such as idea generation, idea promotion, and idea implementation, each requiring different individual behaviors to drive innovation forward (Scott & Bruce, 1994). This multistage perspective is further echoed in research that conceptualizes innovation behavior as involving the recognition of problems, the development of novel ideas, advocacy for those ideas, and their successful implementation in practice (Janssen, 2000; Yuan & Woodman, 2010).

Some scholars extend these models by adding new dimensions. Innovation behavior is seen to include modifying and adapting ideas to suit organizational needs, thus emphasizing a more dynamic and cyclical nature of the process (Thurlings et al., 2015). A four-stage model has also been proposed, involving exploration of opportunities, idea generation, championing, and application of ideas (De Jong & Den Hartog, 2010).

The typological classification of innovation behavior into technical and administrative types further expands its scope. Such distinctions underscore the fact that innovation can involve not just products and services but also administrative systems and procedures (Damanpour, 1991). Similarly, innovation behavior has been described as the process of generating and applying novel ideas in the workplace, integrating both creativity and practical implementation (Anderson, De Dreu, & Nijstad, 2004).

Other definitions emphasize the proactive nature of innovation, where individuals seek to introduce valuable changes to work processes and outputs (Siregar et al., 2019). Innovation behavior may also involve systematic efforts to manage and implement ideas in ways that enhance competitive advantage and ensure sustainable development (Bawuro et al., 2019).

In the context of China, the phenomenon of innovative behavior has been characterized as a multifaceted process comprising stages such as the generation of ideas, their subsequent introduction, and the practical implementation at diverse organizational levels (Huang, 2004). It is also viewed as involving both the production of novel ideas and their realization in practice (Yang, 2011).

Taken together, these definitions converge on the understanding that innovation behavior consists of generating, promoting, and applying new and useful ideas in organizational settings. While scholars differ in whether they frame this as a multidimensional process or a general activity, most agree on its relevance to creativity, problem-solving, and organizational improvement (Amabile, 1988; Scott & Bruce, 1994; De Jong & Den Hartog, 2010; Bawuro et al., 2019).

This study considers surgeons' innovation behavior as the generation of ideas for adopting new technologies and methods by surgeons in the process of diagnosis and treatment, and the promotion of successful implementation of the innovation.

Table 2.2

Crosscutting of Innovation Behaviors

Dimension of innovation behavior / Authors (year)	Idea generation	Idea realization	Idea promotion	Opportunity exploration	Idea Championing	Application	Novelty	Usefulness
Siregar et al. (2019)	✓	✓						
Bawuro et al. (2019)	✓	✓						
De Jong and Den Hartog (2010)	✓			✓	✓	✓		
Yuan and Woodman (2010)	✓	✓	✓					
Lu Xiaojun (2007)	✓	✓						
Huang Zhikai (2004)	✓	✓						

Dimension of innovation behavior / Authors (year)	Idea generation	Idea realization	Idea promotion	Opportunity exploration	Idea Championing	Application	Novelty	Usefulness
YangYing(2001)	✓	✓						
Janssen (2000)	✓	✓	✓					
Scott & Bruce (1994)	✓	✓	✓					
De Dreu, and Nijstad (2004)	✓	✓						
Amabile (1988)							✓	✓
Total	10	9	3	1	1	1	1	1

Source: Researcher (2024).

Idea generation is conceptualized as the process of creating novel and valuable ideas, emphasizing the creative formulation of new concepts or solutions (Amabile, 1988). It is also viewed as a process through which individuals or groups develop innovative and actionable ideas when faced with problems or opportunities, highlighting the importance of both originality and practicality in the ideas generated (Scott & Bruce, 1994). In organizational contexts, idea generation is seen as the development of original and practical solutions aimed at addressing workplace challenges (Shalley, Zhou, & Oldham, 2004). Furthermore, it is regarded as a pivotal phase in the innovation process, where individuals or teams generate novel ideas to address issues or seize emerging opportunities (West, 2002).

In conclusion, the concept of idea generation within the scope of this research pertains to the cognitive process through which surgeons formulate novel and innovative ideas or solutions when confronted with clinical dilemmas, surgical obstacles, or prospects for enhancement of healthcare processes.

Idea realization refers to the process of transforming creative concepts into practical and operational outcomes. It encompasses activities such as development, testing, refinement, and application to ensure that ideas are effectively translated into desired results (Van de Ven, 1986). This juncture is acknowledged as an essential segment within the innovation continuum, wherein the emphasis transitions from the generation of concepts to the execution phase, encompassing the tangible development of products, services, or methodologies (Amabile, 1988). It typically requires systematic planning, allocation of resources, collaboration among team members, and iterative feedback to support effective execution (Kanter, 1988). Moreover, idea realization is considered the execution phase wherein innovative ideas are brought to fruition through tangible outputs such as new products, services, or organizational processes (Damanpour, 1991).

In summary, idea realization refers to the process of successfully translating a generated innovative idea into actual clinical practice or surgical operations. This encompasses the execution of novel surgical methodologies or strategies, the enhancement and execution of innovative patient management initiatives, or the effective creation and application of advanced medical apparatus and instruments.

2.4.4 Measurement of Innovation Behaviors

Two of the most widely used instruments for assessing employees' innovation behavior are the scales developed by Scott and Bruce (1994) and Kleysen and Street (2001), both of which have been extensively validated in organizational research. The Innovation Behavior Scale proposed by Scott and Bruce (1994) is grounded in Kanter's (1988) three-stage model of individual innovation, comprising six items that assess behaviors across the innovation process. Building on this foundation, Janssen (2000) extended the scale by categorizing innovation behavior into three distinct dimensions—idea

generation, idea promotion, and idea implementation—each represented by three items. The scale, totaling nine items, was evaluated through both employee self-reports and supervisor ratings. The research findings indicated substantial intercorrelations among the various dimensions, thereby endorsing the conceptualization of innovative behavior as a singular construct, with Cronbach's alpha coefficients attaining 0.95 for self-evaluations and 0.96 for evaluations by supervisors (Janssen, 2000). Similarly, research by Yun Liu and Jintao Shi (2009) in the Chinese context confirmed that innovation behavior can be considered a single-dimensional construct and that the measurement scale demonstrates strong reliability and validity.

In contrast, Kleysen and Street (2001) conceptualized innovation behavior as a multi-stage process comprising five dimensions: opportunity exploration, idea generation, investigation, championing, and application. In accordance with this theoretical framework, the researchers formulated a measurement scale comprising five distinct dimensions; nevertheless, the construct validity associated with the scale did not produce wholly satisfactory outcomes. Huang Chi-Kai (2004), employing this scale in Taiwan, found that individual innovation behavior could be more effectively categorized into two dimensions: innovative idea generation and innovative idea implementation. The factor loadings and internal consistencies of the items in this revised structure met acceptable psychometric standards. A similar conclusion was drawn by Lu Xiaojun (2007) in a mainland China study, which, along with the findings of Yang Ying (2011), supports the two-dimensional model as being more applicable to the Chinese context and more consistent with the current study's conceptualization of employee innovation behavior.

Therefore, in the empirical research section, this study will refer to Yang Ying's (2011) two-dimensional scale of innovation behavior to develop a scale applicable to the innovative behaviors of surgeons.

2.4.5 Influencing Factors of Innovation Behaviors

Analysis and generalization of previous Relevant literature found that the factors affecting the innovation behavior of employees contain organizational factors, leader

factors, and the factors of the employees themselves, while affecting the innovation behavior, innovation behavior is not only for the individual behavior but is the result of the interaction between the organization, the leader, and the individual.

2.4.5.1 Leader's Factors

From the leadership perspective, employee innovation behavior is influenced by the style of organizational leadership. A plethora of empirical investigations have demonstrated that leaders significantly influence the enhancement of employee creativity (Chen et al., 2022; Li et al., 2020; Yao & Hao, 2023). Some studies point out that authentic, transformational leadership can effectively promote employee innovation in organizations (Korku & Kaya, 2023; Wu et al., 2022). Su Yi et al. (2018) examined whether there is an impact on employee innovation behavior from the perspective of shared empowering leadership and concluded that shared empowering leadership has a significant positive impact on employee innovation behavior. In addition, leaders with positive information feedback or constructive feedback can stimulate employees' creativity (Zheng et al., 2022).

2.4.5.2 Organizational Perspective

From the organizational perspective, it is the atmosphere of the organization that influences the results of innovation behavior. Organizational determinants can catalyze the creative actions of employees, while attributes of the organization, including its culture, resources, compensation mechanisms, technological infrastructure, strategic orientation, and structural composition, can significantly affect the creativity of employees (Li et al., 2021; Vargas-Hernández & Vargas-González, 2022). A substantial body of empirical research has substantiated the influence of the organizational innovation climate on the innovative behaviors of employees, illustrating that an innovation-supportive organizational climate exerts a markedly positive effect on individual innovation behaviors (Scott & Bruce, 1994), and employees who benefit from organizational support, characterized by encouragement and active listening from their supervisors, exhibit heightened levels of innovativeness in their professional undertakings (Peng et al., 2023).

Liu Yun and Shi Jintao (2009) investigated the effects of the interaction of organizational innovation climate and individual motivational preferences on employees' innovation behavior. The findings indicated that extrinsic motivational preferences positively moderated the relationship between organizational innovation climate and employee innovation behavior.

2.4.5.3 Individual Perspective

Cognitive and thinking abilities have been recognized as critical determinants of employee creativity, as they influence individuals' capacity to generate and implement novel ideas (Shalley, 1991). Individuals exhibiting creative cognitive styles are predisposed to diligently investigate viable solutions to challenges and demonstrate a pronounced propensity for risk-taking behaviors, both of which are regarded as critical determinants of creative productivity (Shalley, 2004). Furthermore, empirical investigations have underscored the influence of emotional states in the development of creativity. Xu and Zhao (2020) argue that positive emotions stimulate individuals to transcend habitual behaviors, thereby promoting innovative and creative thinking. In alignment with this perspective, Yan et al. (2023), through a longitudinal investigation, substantiated a beneficial correlation between positive emotional states and the creativity exhibited by employees. Furthermore, Bi and Wang (2013) found that creativity levels are maximized when employees experience both strong positive and negative emotions within a work environment characterized by supervisory support, suggesting that the dynamic interplay of emotional experiences can enhance creative performance under supportive conditions.

2.5 Theories and Concepts Related to Psychological Empowerment

2.5.1 Self-Determination Theory

Self-determination theory represents a cognitive framework for understanding motivation, articulated by Edward L. Deci and Richard Ryan (1985), and this theoretical construct emphasizes the examination of intrinsic motivation and the forces underpinning

self-determination in behavioral contexts. The causes and motivational forces of human behavior come from both the task itself and from outside the task itself, and accordingly, motivational psychologists divide motivation into two categories: intrinsic motivation and extrinsic motivation. The motivation derived from the activity itself is referred to as intrinsic motivation, whereas the motivation originating from external sources is termed extrinsic motivation. Deci and Ryan (1985) posited that intrinsic motivation encompasses engagement in an activity driven by inherent interest and pleasure, which invigorates and propels an individual's behavior independently of external rewards and pressures. The inherent characteristics of the activity provide emotional gratification for the individual, culminating in a sense of achievement. Intrinsic motivation is comprised of three primary components: the individual's innate curiosity, the enjoyment derived from the activity, and the inherent challenges presented by the task. External motivation refers to the fact that the cause of the behavior and the motivating force come from outside the activity, i.e., the outcome of the activity leads to external rewards. An individual's activity can be motivated by both internal and external motives. Internal motivation plays a vital role in an individual's ability to demonstrate creativity in the field in which he or she is engaged. Amabile (1983) said, "Internal motivation is the socio-psychological basis of creativity, and people are most creative when they are motivated by the satisfactions and challenges of the work itself, rather than by extrinsic pressures ".

Self-determination means that an individual engages in an activity solely out of a sense of self-desire, autonomy of choice, and personal approval, experiencing autonomy and selectivity of action. Self-determination theory posits that individual behavior comprises two distinct dimensions: self-determined behavior and non-self-determined behavior. Self-determined behavior is characterized by four principal attributes: the autonomy of action. Specifically, individuals engage in behaviors that are aligned with their personal preferences, interests, and capabilities, rather than being compelled by external pressures, coercive influences, or adherence to the expectations of others. Self-regulation of behavior. That is, people's behavior is self-initiated and self-managed: they themselves decide when to initiate it, when to terminate it, what behavioral results to

achieve, and the course of action is self-regulating. Psychological empowerment, that is, individuals should have the ability and belief in self-determination, and trust themselves to determine the process and results of behavior. Self-actualization. The realization of personal value goals through one's own efforts and persistence.

Self-determination theory posits that socio-environmental variables interact synergistically with individual trait characteristics to foster intrinsic motivation by fulfilling the individual's three primary psychological needs: autonomy, competence, and relatedness. Furthermore, this theory elucidates the internalization of extrinsic motivation, which subsequently enhances the individual's work-related behaviors and overall psychological well-being; the process of influence is depicted in Figure 2.2.

Figure 2.2

Causal Model of Self-Determination Theory

Source: Deci, E. L., & Ryan, R. M. (1985).

2.5.2 Definition of Psychological Empowerment

The construct of psychological empowerment has been delineated and scrutinized by numerous academics, emphasizing diverse dimensions and theoretical frameworks.

At the micro-level, psychological empowerment is widely regarded as a subjective construct rooted in individuals' personal work experiences and internal cognitive evaluations. It is framed as a developmental process by which individuals acquire an augmented perception of control and agency within their professional environment, consequently alleviating sensations of helplessness and bolstering task-related self-efficacy (Conger & Kanungo, 1988). As an intrinsic motivational state, psychological empowerment arises from the cognitive assessments employees make regarding their roles and responsibilities, reflecting a deeper psychological engagement with work (Thomas & Velthouse, 1990). This construct is conventionally operationalized via a four-dimensional framework, encompassing meaning—the alignment between individual values and professional objectives; competence—the conviction in one's capability to effectively perform work-related tasks; self-determination—the perception of autonomy in the initiation and regulation of actions; and impact—the perceived ability to affect strategic, administrative, or operational outcomes within the organization. Collectively, these dimensions encapsulate the fundamental nature of employee psychological ownership and the sense of purpose they derive from their occupational settings.

Building on earlier conceptual frameworks, psychological empowerment has been further refined as a state that captures individuals' internalized sense of control, agency, and intrinsic motivation in the workplace. This construct is typically operationalized through a multidimensional lens, with a dominant approach emphasizing four core dimensions: meaning, competence, self-determination, and impact. These dimensions denote the extent to which employees perceive a congruence between their individual values and professional objectives, their self-assuredness in executing tasks, their degree of autonomy in decision-making processes, and their capacity to impact organizational results, respectively (Spreitzer, 1995). Perceived control over the work environment remains a central element, reinforcing the view that empowerment is shaped by how employees subjectively interpret their roles and responsibilities (Mishra & Spreitzer, 1998). Core psychological drivers—particularly self-efficacy and autonomy—are seen as critical for fostering a belief in personal influence over work tasks (Quinn & Spreitzer,

1997). From this vantage point, psychological empowerment embodies a motivational state that enhances employees' perception of significance and individual efficacy within the workplace (Avolio et al., 2004; Maynard et al., 2012). Alternative models also highlight slightly varied dimensions; for instance, psychological empowerment has been conceptualized as comprising perceived control, perceived competence, and goal internalization—underscoring the internalization of organizational goals as a pathway to influence and engagement (Menon, 2001). Taken together, these conceptualizations emphasize that psychological empowerment is fundamentally rooted in employees' subjective experiences, particularly their perceptions of control, capability, and meaningful engagement with their work.

In juxtaposition to micro-level methodologies, certain academics embrace a macro-level lens, framing psychological empowerment as an intricate, multi-tiered developmental phenomenon that encompasses individual, organizational, and communal dimensions. From the lens of social and community psychology, psychological empowerment is viewed as encompassing behavioral, cognitive, and emotional components that operate across different systemic levels. At the individual level, this perspective highlights key elements such as interpersonal competence, cognitive evaluation of one's role in society, and active behavioral engagement, including participation in community decision-making and collective initiatives (Zimmerman, 1990). Extending this view to organizational settings, psychological empowerment is also understood as a motivational state that captures employees' perceptions of autonomy, competence, and influence within the broader organizational environment (Seibert et al., 2011). These macro-level frameworks emphasize that psychological empowerment is not confined to internal cognitive states but is embedded in broader social interactions and institutional structures, functioning as a catalyst for capacity-building, shared decision-making, and collective agency across multiple levels of analysis.

These definitions converge around the concept of psychological empowerment as an important psychological state related to employees' perceptions and experiences of their work tasks, particularly emphasizing internal motivation, control, and self-efficacy. This

concept is widely researched in organizational settings, especially as a mediating variable in studies examining various work-related outcomes.

In summary, scholars define psychological empowerment from a single dimension to a multi-dimensional one. This research utilizes the conceptual framework put forth by Spreitzer (1995), which delineates psychological empowerment as a cognitive condition indicative of an individual's perception of control and autonomy within the context of their occupational responsibilities.

Table 2.3

Crosscutting of Psychological Empowerment

Factors of psychological empowerment / Authors (year)	Meaning	Self-efficacy	Self-determination	Impact	Behavioral	Cognitive	Interpersonal competence	Perceived Control	Perceived Competence	Goal Internalization
Maynard, Gilson, & Mathieu (2012)	✓	✓	✓	✓						
Seibert, Wang, & Courtright (2011)	✓	✓	✓	✓						
Avolio, Zhu, Koh, &Bhatia (2004)	✓	✓	✓	✓						
Menon（2001）								✓	✓	✓
Mishra & Spreitzer (1998)	✓	✓	✓	✓						
Quinn & Spreitzer (1997)	✓	✓	✓	✓						
Spreitzer（1995）	✓	✓	✓	✓						
Thomas& Velthous（1990）	✓	✓	✓	✓						

Zimmerman (1990)					✓	✓	✓			
Conger& Kanungo(1988)		✓								
Total	7	8	7	7	1	1	1	1	1	1

Source: Researcher (2024).

Meaning has been conceptualized as the alignment between job demands and an individual's values and behaviors, emphasizing the congruence between personal and organizational expectations (Brief & Nord, 1990). It is also defined as a sense of purpose or personal connection to one's work, reflecting how individuals experience significance in their job roles (Spreitzer, 1995). From another perspective, meaning refers to the perceived value of a work goal or purpose, evaluated in relation to an individual's own ideals and standards (Thomas & Velthouse, 1990). Similarly, meaning is described as the individual's cognitive assessment of the value of work goals and purposes based on their personal value system and evaluative criteria (Li et al., 2006).

In summary, Meaning means a person's perception of the value or importance of their work.

Competence is delineated as an individual's conviction regarding their skills and abilities to proficiently execute work-related responsibilities, embodying a sense of self-assurance in one's occupational efficacy (Spreitzer, 1995). A similar perspective was presented earlier, framing competence as a core element of psychological empowerment, rooted in employees' belief in their ability to complete tasks successfully (Conger & Kanungo, 1988). It is also described as the extent to which individuals perceive themselves as capable of carrying out task activities proficiently and with skill (Thomas & Velthouse, 1990). In addition, competence has been defined as the perception that one possesses the necessary skills to execute job responsibilities effectively (Corsun & Enz, 1999). In a related context, self-efficacy has been recognized as an individual's cognitive assessment regarding their competence to execute particular occupational responsibilities (Li et al., 2006).

In conclusion, self-efficacy refers to an individual's conviction regarding their capacity to execute work-related tasks, and it is a fluid construct, evolving as the person acquires new knowledge and encounters diverse experiences.

Self-determination refers to an individual's perceived sense of autonomy or freedom in determining how to carry out work tasks, emphasizing control over the process and methods of task execution (Spreitzer, 1995; Thomas & Velthouse, 1990). It has also been defined as employees' perception of control regarding the manner in which their tasks are performed, reflecting their discretion in choosing work strategies (Goodale, Koerner, & Roney, 1997). In a comparable manner, self-determination is regarded as the capacity of an individual to exert influence over their occupational endeavors, thereby emphasizing the significance of autonomous decision-making within professional environments (Li et al., 2006).

In summary, self-determination means an individual's sense of choice in initiating and regulating behavior, emphasizing the autonomy of decision-making.

Impact refers to the extent to which individuals perceive that they can influence key outcomes within their organizational environment, including strategic, administrative, or operational aspects (Ashforth, 1989). It signifies an individual's conviction regarding their potential to influence the system within which they function, emphasizing their perceived capacity to effectuate a substantial impact in the workplace (Spreitzer, 1995). In a parallel manner, impact has been delineated as the extent to which employees can exert influence over diverse levels of organizational outcomes, encompassing strategic determinations, administrative operations, and managerial or operational procedures (Li et al., 2006).

In conclusion, the term impact refers to the extent to which a person is able to affect the results of their professional endeavors.

2.5.3 Measurement of Psychological Empowerment

Thomas and Velthouse (1990) only proposed that the concept of psychological empowerment should have four dimensions, but did not develop a corresponding scale. To

investigate the association between psychological empowerment and its associated variables, researchers have constructed various psychological empowerment measurement instruments, with the most notable being the Psychological Empowerment Scale formulated by Spreitzer in 1995. The most representative one is the Psychological Empowerment Scale developed by Spreitzer (1995), who based on the concept of empowerment proposed by Thomas and Velthouse (1990) and developed a scale with 12 items in four dimensions.

Menon (2001) further conceptualized a psychological empowerment scale grounded in his delineation of psychological empowerment, which encompasses nine items distributed across three distinct dimensions.

Chinese academics, including Chao-Ping Li (2006), developed a Chinese adaptation of the psychological empowerment scale grounded in Spreitzer's (1995) empowerment scale through a methodical process that involved expert translation and the completion of the questionnaire by corporate employees, and subsequently investigated the factor structure of the psychological empowerment scale utilizing exploratory factor analysis, while concurrently evaluating both the single-factor model and the four-factor model via validation factor analysis, whereby the findings indicated that the four-factor model received empirical support from the data. The factor model was supported by the data and had good reliability, while the validity of the authorization scale was validated in the Chinese cultural context.

In this study, the four-dimensional psychological empowerment scale revised by Chao-Ping Li (2006) will be consulted to compile the questionnaire.

2.5.4 Studies Related to Psychological Empowerment

In the research domain focusing on psychological empowerment, numerous scholars have explored its mediating role between various leadership styles and employee behaviors, especially innovation behavior. These studies can be broadly categorized into three themes: the mediating effect of psychological empowerment between positive

leadership styles and innovation-related outcomes, its full mediation under negative leadership, and the specific influence of empowerment dimensions across contexts.

Firstly, a substantial corpus of scholarly literature has elucidated that psychological empowerment functions as a partial or complete mediator between affirmative leadership styles and innovative behavior among employees. For instance, empirical investigations have established that transformational leadership exerts a beneficial impact on the innovative behavior of employees, with psychological empowerment serving a partial mediating function (Li, 2018). Similarly, entrepreneurial leadership has been shown to significantly affect innovation behavior, wherein psychological empowerment plays a fully mediating role (Chen, 2015). Within the framework of authentic leadership, empirical studies suggest that both leader-member exchange and psychological empowerment serve as comprehensive mediators in the correlation between leadership and innovative behavior (Shi & Yang, 2015). These findings underscore the vital function of psychological empowerment in transmitting the positive influence of leadership to innovative outcomes.

Secondly, scholars have also examined the role of psychological empowerment under negative leadership conditions. Specifically, it has been empirically demonstrated that abusive supervision exerts a substantial and adverse influence on the innovative behaviors of employees, whereas psychological empowerment is observed to have a significant positive impact and serves as a complete mediating variable within this relational framework (Xia & Ji, 2017). This suggests that psychological empowerment may serve as a psychological buffer, potentially offsetting the detrimental effects of negative leadership on innovation.

Thirdly, some studies have delved into the mediating effects of specific dimensions of psychological empowerment and its broader influence beyond innovation behavior. For instance, scholarly investigations into authentic leadership within educational contexts indicate that varying dimensions of psychological empowerment serve as mediators for distinct outcomes: the construct of “impact” mediates the correlation between authentic leadership and organizational citizenship behavior, whereas the dimensions of “self-determination, meaning, and competence” mediate the association between leadership and

the frequency of absenteeism (Shapira-Lishchinsky & Tsemach, 2014). In a comparable manner, psychological empowerment has been identified as a mediating factor in the relationship between transformational leadership and both organizational citizenship behavior and the intention to turnover (Saira et al., 2021). Moreover, psychological empowerment has been evidenced to partially mediate the relationship between the occupational environment and the clinical decision-making processes of midwives operating within public hospital settings, thus impacting professional efficacy in healthcare environments (Zeng et al., 2022). Additionally, in the Malaysian financial sector, psychological empowerment plays an indirect mediating role between transformational leadership and employee creativity (Ibrahim et al., 2023).

In summary, psychological empowerment, functioning as a mediating variable, exerts a more pronounced mediating effect between various leadership styles, including transformational leadership, and employee innovative behaviors as well as organizational citizenship behaviors, thereby underscoring its pivotal role in augmenting employee innovation behaviors, employee productivity, and organizational citizenship behaviors.

2.5.5 Effect of Psychological Empowerment on Innovation Behaviors

A considerable corpus of scholarly inquiry has underscored the pivotal function of psychological empowerment in the enhancement of innovative behaviors. Grounded in self-determination theory, empirical evidence indicates that leader-member exchange fosters employees' proactive innovative behaviors indirectly via psychological empowerment, with core self-evaluation serving as an essential moderating variable within this framework (Xu et al., 2021). In a parallel investigation, findings have illustrated that empowering leadership positively impacts innovative behaviors through the mediating influence of psychological capital, while emotional intelligence additionally moderates this dynamic (Shi et al., 2018). Further studies have identified leadership styles as key antecedents of innovation outcomes through their impact on psychological empowerment. For instance, the phenomenon of inclusive leadership has been empirically demonstrated to markedly augment innovation performance through its influence on psychological

empowerment and employee innovation behavior, both of which act as mediating and moderating variables within this dynamic (Gupta et al., 2022). In the investigation of the precursors to employee innovation behavior, various researchers have underscored the significance of an innovative climate and alignment between individual values and organizational culture, with psychological empowerment emerging as a pivotal moderator that enhances the correlation between person-organization fit and innovation behavior (Nham et al., 2024). The influence of transformational and empowering leadership styles has also been confirmed in enhancing innovation through the improvement of psychological empowerment among employees (Ali & AlAbrrow, 2023). Moreover, psychological empowerment has been associated with personal initiative, which functions as a mediating variable in its influence on the innovative behaviors exhibited by middle managers, thus suggesting both a direct and indirect mechanism through which psychological empowerment enhances innovation (James et al., 2023). In the healthcare domain, empirical findings have similarly affirmed the central role of psychological empowerment in promoting innovation behavior. One study demonstrated that psychological empowerment mediates the relationship between ethical climate, innovative culture, and nurses' job performance and innovation behavior, suggesting that it functions as a critical linkage between organizational context and innovative outcomes in nursing practice (Akkoç et al., 2022). A subsequent investigation corroborated a favorable correlation between transformational leadership, psychological empowerment, and innovative behavior among nursing professionals, thereby underscoring the premise that cultivating empowerment via leadership is imperative for promoting innovation within healthcare environments (Zhang et al., 2022).

In conclusion, these studies collectively underscore the significant role of psychological empowerment in mediating and moderating the relationship between various leadership styles, individual traits, and innovation behavior. The style of leadership considerably facilitates the innovative behaviors of employees by augmenting their perceptions of psychological empowerment, which encompasses their feelings of self-efficacy, autonomy, and the internalization of the meaning and purpose of their work.

Furthermore, individual variances such as emotional intelligence and a proactive disposition, along with contextual factors such as organizational climate and working conditions, also serve as moderating variables in the interplay between psychological empowerment and innovative behavior. These findings emphasize that organizations should pay attention to the cultivation of psychological empowerment when developing leadership, shaping organizational climate, and designing human resource management strategies to stimulate employees' innovative potential.

2.6 Relevant Research

Daud et al. (2024) studied on “Transformational Leadership and Career Development on Hospital Nurse Performance” . This research used quantitative methods to explore the role of transformational leadership in enhancing hospital employee performance and how career development mediates the relationship between transformational leadership and hospital employee performance. The results of the study indicated that transformational leadership had a positive impact on hospital employee performance and career development also had a significant impact on hospital nurse performance.

Pattali et al. (2024) studied on “Effect of leadership styles on turnover intention among staff nurses in private hospitals: the moderating effect of perceived organizational support”. This research explored the effects of transformational versus authentic leadership styles on nurses' willingness to leave and the moderating role of perceived organizational support in private hospitals. The study used Smart-PLS for PLS-SEM (Partial Least Squares Structural Equation Modeling) to measure direct and indirect effects. The results of the study indicated that transformational leadership style, authentic leadership style, and perceived organizational support had a significant negative effect on nurses' propensity to leave their jobs.

Wilaphan et al. (2023) studied on “Transformative leadership and innovative behavior in medical education: Mediating effects of psychological empowerment and creative self-efficacy”. This research used an empirical research approach to explore the relationship between transformational leadership and innovation behavior with psychological empowerment and innovation self-efficacy as mediating variables. Data were collected from 153 staff members of a medical school in Thailand through a self-reported questionnaire. Structural equation modeling (SEM) results indicated that transformational leadership was significantly and positively related to psychological empowerment, creative self-efficacy, and innovation behavior.

Kun Wang et al. (2023) studied on “The mediating effect of psychological empowerment on structural empowerment and innovative behavior in pediatric nurses”. This research explored the mediating effect of psychological empowerment between structural empowerment and innovation behavior among pediatric nurses. The study investigated 574 pediatric nurses using the General Information Questionnaire, the Nurses' Innovation behavior Scale, the Working Conditions Efficacy Scale, and the Psychological Empowerment Scale. The results of the study found a positive correlation between pediatric nurses' structural empowerment, psychological empowerment and innovation behavior; psychological empowerment had a mediating effect between pediatric nurses' structural empowerment and innovation behavior.

Korku and Kaya (2023) studied on “Relationship between authentic leadership, transformational leadership and innovative work behavior: mediating role of innovation climate”. This research explored the effects of transformational and authentic leadership characteristics of healthcare managers on employees' innovative work behaviors and the mediating role of innovation climate. The study was conducted in 19 hospitals in Turkey through an empirical approach and data were collected using the transformational leadership questionnaire, authentic leadership questionnaire, innovation climate assessment tool, and innovative work behavior scale. The results of the study found that both transformational and authentic leadership influence innovative work behaviors, but authentic leadership is more effective than transformational leadership.

Akman (2023) studied on “The Effect of Leader-Member Exchange on Job Crafting in Nursing: The mediating role of psychological safety”. This research explored the impact of leader-member exchange on the shaping of nursing and the mediating role of psychological safety between the two. The study was conducted among 782 nurses in Istanbul, Turkey and this study was analyzed using structural equation modeling. The results of the study found that leadership-member exchange had a positive impact on nursing job shaping and that psychological safety played a mediating role.

Zhang et al. (2022) studied on “Chinese nurses' innovation capacity: The influence of inclusive leadership, empowering leadership and psychological empowerment”. This research explored the relationship between inclusive leadership, empowering leadership, nurses' perceived psychological empowerment, and nurses' innovativeness. The study was a cross-sectional survey of 1,355 nurses from 10 hospitals in Tianjin, China, using convenience sampling method. Correlation analysis, univariate analysis and PROCESS macro analysis were used to analyze the data. The study found that high inclusive leadership, high empowering leadership, and high psychological empowerment were associated with high innovativeness.

Zhang et al. (2022) studied on “Does transformational leadership and psychological empowerment improve nurses' innovative behavior during COVID-19 outbreak? A cross-sectional study”.This research aimed to investigate the relationships between transformational leadership, psychological empowerment, and innovation behavior among 1317 nurses in China using convenience sampling and multiple regression analysis, concluding that both transformational leadership and psychological empowerment are vital in promoting nurses' innovation behavior.

Cougot et al. (2022) studied on “Impact of empowering leadership on emotional exhaustion: A controlled interventional study in a large French university hospital complex”. This research assessed the impact of a systemic intervention on empowered leadership in a large hospital characterized by a culture of controlled management and a hierarchical organization. Interventions such as empowered leader training, direct field experiments with empowered leaders, and mentoring were used to collect data before and

after the intervention. It was found that in the presence of decreased leadership empowerment and increased emotional exhaustion, shifting hospital management to empowered leadership prevented increased emotional exhaustion.

Ashfaq et al. (2021) studied on “How transformational leadership influences innovative behavior: The mediating role of psychological empowerment and proactivity of employees”. This research explores the influence of transformational leadership on the innovation behavior of employees in the organization by using empirical research method. Collecting data from 230 employees in large public sector. The results of this study found the applicability of psychological empowerment and initiative to innovation behavior, and found that they are the mediators of the relationship between transformational leadership and innovation behavior.

Jønsson et al. (2021) studied on “How are empowering leadership, self‐efficacy and innovative behavior related to nurses' agency in distributed leadership in Denmark, Italy and Israel?”. This research aimed to explore how empowering leadership, self-efficacy, and innovation behavior are related to nurses' agency in distributed leadership across Denmark, Italy, and Israel, using a cross-sectional survey method, and concluded that empowering leadership positively influences nurses' innovation behavior by enhancing their sense of agency.

Slåtten et al. (2020) studied on “The impact of individual creativity, psychological capital, and leadership autonomy support on hospital employees’ innovative behaviour”. This research factors in hospital organizations that potentially influence individual employee innovation. The study developed a conceptual model and tested it with a sample of 1008 hospital employees. Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to analyze the data in two steps, measurement model and structural model, using SmartPLS 3 software. The results of the study showed that leadership autonomy support has a multifaceted effect on the innovation behavior of hospital employees.

Alotaibi et al. (2020) studied on “Does emotional intelligence and empowering leadership affect psychological empowerment and work engagement?”. This research empirically investigated the role of emotional intelligence and empowered leadership in increasing psychological empowerment and work engagement of employees in private hospitals. The study collected data from nurses in five private hospitals in Riyadh, Saudi Arabia. The study found a significant positive correlation between emotional intelligence, empowered leadership, psychological empowerment and work engagement.

Xiang Jialian (2020) studied on “Analyzing the effect of authorization management on innovation behavior and job satisfaction of breast surgery nurses”. This research explored the effects of authorization management on innovation behavior and job satisfaction of nursing staff in breast surgery. Through the implementation of structural authorization and psychological authorization management, increasing incentives, using the Nurses' Innovation behavior Scale to compare the innovation behaviors of breast surgery nurses before and after the implementation, and using the questionnaire method to compare the satisfaction of 50 patients before and after the implementation. It was found that empowerment management could significantly increase breast surgery nurses' self-efficacy, autonomy, work meaning, and work impact, thus promoting their innovation behaviors and improving patient satisfaction.

Oducado, Ryan Michael.(2019) studied on “Leader Empowering Behaviors and Psychological Empowerment as Perceived by Young Hospital Staff Nurses: A Pilot Study”. This research measured young nurse leaders' perceptions of leadership empowerment behaviors and psychological empowerment through an empirical study. The study used a cross-sectional survey design and involved 44 nurses randomly selected from a private teaching training hospital in Iloilo City, Philippines. The study found that Leader empowering behaviors was significantly related to staff nurses' perception of psychological empowerment.

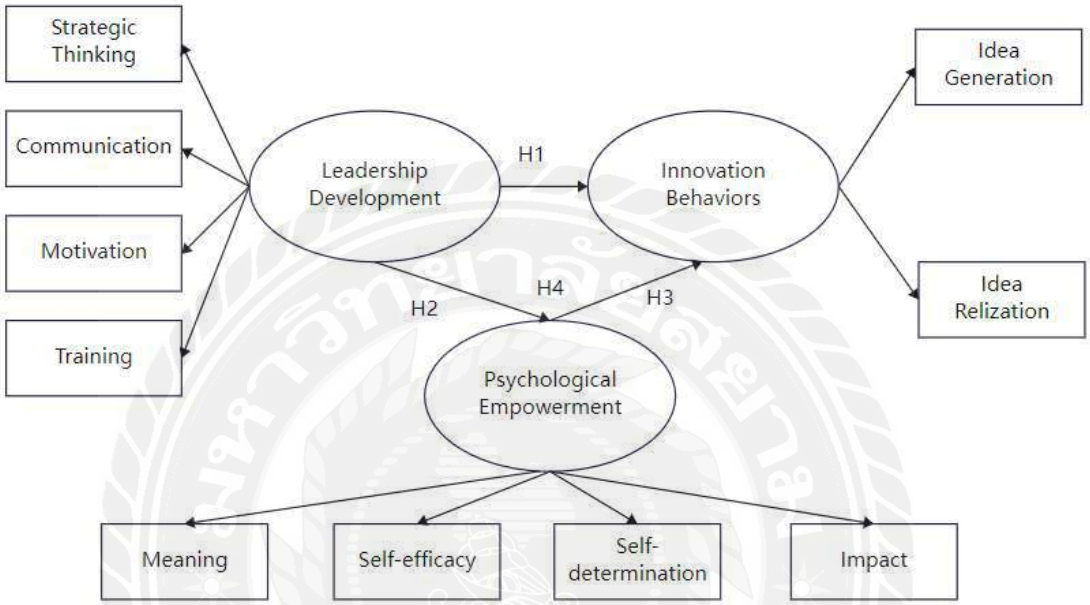
Lv Meng et al. (2019) studied on “The correlation of perceived honest leadership, psychological empowerment and innovative behavior among nurses”. This research explored the relationship between nurses' perceived honest leadership, psychological

empowerment and innovation behavior in a tertiary-level A general hospital, and to analyze the mediating role of psychological empowerment between honest leadership and nurses' innovation behavior. The study used the Integrity Leadership Questionnaire, the Psychological Empowerment Scale and the Nurses' Innovation behavior Scale to conduct a questionnaire survey of 909 registered nurses in seven tertiary-level A general hospitals in Shandong Province, China. The study found that authentic leadership was positively correlated with psychological empowerment, psychological empowerment was positively correlated with innovation behavior, and psychological empowerment mediated between authentic leadership and nurse innovation behavior.

In conclusion, in recent years, scholars from relevant countries have carried out certain empirical studies on the relationship between transformational leadership, empowering leadership, and authentic leadership on the innovation behaviors, job performance, job satisfaction, etc. of hospital physicians and nurses, and verified the mediating effects of psychological empowerment, psychological safety, and innovative atmosphere, which provide important references and support for this study.

2.7 Conceptual Framework, Operational Definition, Hypothesis and Explanation of Hypothesis

Figure 2.3: Conceptual Framework



From the above framework, four hypotheses can be listed as follows:

Hypothesis 1: Leadership Development has a direct effect on Surgeon Innovation Behaviors in hospitals in China.

Hypothesis 2: Leadership Development has a direct effect on Psychological Empowerment of surgeons in hospitals in China.

Hypothesis 3: Psychological Empowerment has a direct effect on Surgeon Innovation Behaviors in hospitals in China.

Hypothesis 4: Psychological Empowerment mediates the relationship between Leadership Development and Surgeon Innovation Behaviors in hospitals in China.

2.7.2 Operational Definition

Strategic Thinking

Means the surgeon's ability to think holistically, understand healthcare dynamics, set long-term goals, anticipate changing trends, and drive change in a complex and uncertain healthcare environment.

Communication

Means the ability of the surgeon to promote information sharing, opinion exchange, and problem solving among team members through clear and effective language expression and active listening during the operation and related activities.

Motivation

Means the surgeon's ability to motivate and enthuse team members through clear division of labor, goal setting, task organization, and ongoing feedback.

Training

Means the process by which surgeons continue to improve their clinical and leadership skills through participation in a variety of leadership programs, skills training, and reflective learning.

Meaning

Means the degree of personal value, goal congruence, and intrinsic importance surgeons feel in their work.

Self-efficacy

Means the degree to which a surgeon trusts in his or her own abilities and is self-efficacious in accomplishing the tasks of the job.

Self-determination

Means the surgeon's experience of autonomy and sense of control in his or her work, as reflected in the independence and autonomy he or she possesses in the way work tasks are handled, decisions are made, and goals are achieved.

Impact

Means the surgeon's sense of influence and control over decisions and work outcomes within the department.

Idea Generation

Means the ability of a surgeon to proactively explore opportunities to improve surgical techniques, processes, or postoperative care in the course of their work and to come up with innovative ideas and solutions.

Idea Realization

Means the ability of a surgeon to evaluate, promote, and implement new techniques or treatments in practice.

2.7.3 Explanation of Hypothesis

Hypothesis 1: Leadership Development has a direct effect on Surgeon Innovation Behaviors in hospitals in China.

Meaning

Leadership development enhances surgeons' knowledge, skills, behaviors, and abilities, thereby stimulating surgeons' potential for innovation.

Reason

Through comprehensive training in various competencies, leadership development enhances surgeons' strategic thinking abilities, enabling them to better understand the forefront of surgical advancements. It also improves their communication and motivational

skills with team members, thereby facilitating the application of innovative techniques and methods in surgical procedures and patient care.

Theory or Supporting Research

Strategic thinking, communication effectiveness, and decision-making speed are leadership-related factors that significantly contribute to innovation performance and behavior. Strategic thinking enhances the leader's ability to identify and leverage innovation opportunities, enabling forward-looking decisions in rapidly changing environments (Goldman & Scott, 2016). The triadic dimensions of strategic cognition—systems cognition, divergent cognition, and reflective cognition—have been demonstrated to exert a favorable impact on innovation results (Olaleye et al., 2020). Communication and strategic decision-making speed have also demonstrated significant positive effects on innovation performance based on data collected from 450 managers and decision-makers across 150 firms in the Iranian food industry (Molavi, 2021). Effective communication facilitates creative thinking and the generation of novel ideas within organizations, playing a crucial role in supporting innovation behaviors in sectors such as tourism (Zach, 2016).

Training, participative decision-making, and employee motivation are additional organizational practices that have been empirically associated with enhanced innovation behavior. Participative decision-making and employee motivation positively influence employees' eco-innovation capabilities and behaviors, while leadership training plays a significant role in stimulating innovative actions (Qalati et al., 2023). The perception of developmental training among personnel within Malaysian small and medium-sized enterprises (SMEs) has been empirically shown to exert a substantial influence on their innovative behaviors, as evidenced by structural equation modeling conducted on a cohort of 635 employees drawn from 200 distinct firms (Jalil et al., 2021).

Hypothesis 2: Leadership Development has a direct effect on Psychological Empowerment of surgeons in hospitals in China.

Meaning

By enhancing surgeons' leadership abilities, it can strengthen key elements of psychological empowerment such as self-efficacy, a sense of control, meaningfulness, and self-determination.

Reason

The objectives of leadership development, which encompass the enhancement of communication competencies, the implementation of motivational frameworks, and the cultivation of strategic cognitive abilities, facilitate a heightened sense of control and mastery for surgeons in both clinical and managerial contexts; furthermore, through engagement in leadership training, surgeons can acquire an expanded perspective and a novel cognitive approach, ultimately fostering an amplified sense of impact and significance within the realm of medical practice.

Theory or Supporting Research

Proficient communication and leadership development have been demonstrated to significantly contribute to the enhancement of psychological empowerment within the workforce. Strategic thinking enhances healthcare workers' sense of mission and purpose by mediating the relationship between empowered leadership and work engagement, thereby contributing to a stronger perception of psychological empowerment (Abbas & Khali, 2016). Effective communication functions as a fundamental mechanism in this process by facilitating transparent information dissemination and fostering open discourse, which consequently enhances employees' trust and self-efficacy. This allows individuals to better comprehend their roles and expectations, ultimately improving their initiative and autonomy (Hackman & Johnson, 2021). Communication between school principals and teachers has also been shown to significantly predict psychological empowerment and emotional commitment, emphasizing the communicative process as a key pathway to enhanced psychological states in educational contexts (Yao et al., 2020).

Psychological empowerment also positively influences other motivational and attitudinal outcomes. It enhances organizational trust and employee motivation by making employees feel valued and capable, particularly when accompanied by positive feedback and reward mechanisms (Yilmaz & Toylan, 2021). The enactment of empowering leadership behaviors—exemplified by the delegation of decision-making authority and the conferral of responsibility—serves to further enhance employees' autonomy and control over their professional tasks, thereby intensifying their psychological commitment to organizational objectives (Zhang et al., 2022).

Hypothesis 3: Psychological Empowerment has a positive effect on Surgeon Innovation Behaviors in hospitals in China.

Meaning

When surgeons experience higher levels of psychological empowerment, they are more likely to engage in innovation behaviors.

Reason

Psychological empowerment facilitates the innovative behaviors of hospital surgeons by augmenting their autonomy, self-efficacy, sense of purpose, and propensity to engage in risk-taking, consequently fostering creative problem-solving and ongoing enhancements in patient care.

Theory or Supporting Research

Psychological empowerment plays a critical mediating and moderating role in linking leadership and organizational contextual factors to employees' innovation behavior. Leveraging the principles of self-determination theory, research has demonstrated that the quality of leader-member exchange exerts an indirect impact on employees' proactive innovation behaviors via the mechanism of psychological empowerment, whereby core self-evaluation acts as a moderator in this dynamic by augmenting individuals' internal motivational resources (Xu et al., 2021). Psychological empowerment also functions as a key moderating variable in the relationship between

person–organization fit and innovation behavior, where a supportive organizational climate and alignment of personal and organizational values foster empowered mindsets that translate into greater innovative output (Nham et al., 2024).

Transformational leadership has likewise been demonstrated to facilitate innovative behavior via the mediating mechanism of psychological empowerment. When individuals in the workplace perceive significance, capability, autonomy, and influence within their positions, they are predisposed to participate in creative activities and tasks pertinent to innovation. Emotional commitment further strengthens this process by reinforcing employees' emotional investment in organizational goals, thereby enhancing the transformative effect of leadership (Li, 2018). These findings underscore the central role of psychological empowerment as both a psychological conduit and boundary condition in facilitating innovation behaviors in the workplace (Nham et al., 2024).

Hypothesis 4: Psychological Empowerment mediates the relationship between Leadership Development and Surgeon Innovation Behaviors in hospitals in China.

Meaning

Leadership development, mediated by psychological empowerment, can more significantly influence surgeon innovation behavior.

Reason

When surgeons feel psychologically empowered, they are more likely to take initiative, experiment with new techniques, and engage in innovative problem-solving. Empowered individuals often feel a sense of ownership over their work and are more willing to challenge the status quo. leadership development enhances psychological empowerment, which, in turn, encourages surgeons to engage in innovation behavior, such as adopting new surgical techniques, developing novel procedures, or finding creative solutions to surgical challenges.

Theory or Supporting Research

Strategic thinking, communication competence, and inclusive leadership styles are essential mechanisms through which psychological empowerment is fostered, ultimately promoting innovation behavior among employees. Leaders' strategic thinking abilities have been shown to enhance employees' psychological empowerment by cultivating a strong sense of mission and purpose, thereby strengthening their engagement with organizational objectives (Abbas & Khal, 2016). Communication competence similarly contributes to psychological empowerment by fostering an open and trusting environment in which employees feel heard and valued. The ability to partake in transparent discourse has been empirically demonstrated to exhibit a significant correlation with the psychological empowerment of employees, especially concerning their perceived self-esteem and sense of agency (Saira et al., 2021).

Inclusive leadership further amplifies these effects by creating a participative climate in which employees feel encouraged to contribute novel ideas. Through this process, employee innovation behavior acts as a key mediating mechanism linking inclusive leadership to improved innovation performance, emphasizing the centrality of psychological empowerment in this pathway (Gupta et al., 2022). In a similar vein, leadership styles such as transformational and empowering leadership have been demonstrated to promote innovation behavior by reinforcing employees' self-efficacy, autonomy, and perceived impact—core dimensions of psychological empowerment that directly stimulate innovation-relevant behaviors (Ali & AlAbrrow, 2023).

CHAPTER 3
RESEARCH METHODOLOGY

This chapter details the research methodology adopted to investigate the role of leadership development in fostering surgeon innovation behaviors and the mediating effects of psychological empowerment in Chinese hospitals. A mixed-methods methodology, integrating both quantitative and qualitative techniques, was employed to facilitate an exhaustive comprehension of the research aims. The aim of the study is to understand the mechanisms by which leadership development influences Chinese surgeons' innovation behaviors. The chapter comprises the following sections:

3.1 Research Design

This study utilized a mixed-methods framework, wherein quantitative analysis functions as the predominant methodology while qualitative examination contributes ancillary perspectives. The research design is structured as follows:

3.1.1 Quantitative Research

A questionnaire was created to study the role of leadership development on Chinese surgeon innovation from a selected sample in the context of Chinese society and culture. The research further investigated the intermediary function of psychological empowerment within this association by measuring the relationship between leadership development and Chinese surgeons' innovation behaviors, as well as the specific mechanism of action between leadership development and Chinese surgeons' innovation behaviors.

3.1.2 Qualitative Research

In-depth interviews were conducted with Chinese surgeons, hospital leaders, and government officials. These interviews aimed to gather qualitative data to complement the findings from the questionnaire survey, providing richer and more nuanced insights into the mechanisms underlying leadership development and innovation behaviors.

3.2 Population and Sample

3.2.1 Population

The target population consisted of surgeons working in hospitals across China, as recorded in the China Health Statistical Yearbook 2022. The total population included 437,335 surgeons, distributed across 31 provinces (see Table 3.1).

Table 3.1

Number of surgeons in China

Rank	Provinces	Number of Surgeons	Percentage (%)
1	Guangdong	47,433	10.85
2	Jiangsu	44,827	10.25
3	Shandong	32,188	7.36
4	Zhejiang	28,861	6.60
5	Sichuang	21,023	4.81
6	Henan	20,673	4.73
7	Hubei	19,510	4.46
8	Fujian	19,003	4.35
9	Hunan	17,485	4.00
10	Shanghai	16,508	3.77
11	Anhui	16,449	3.76

Rank	Provinces	Number of Surgeons	Percentage (%)
12	Hebei	15,363	3.51
13	Beijing	15,299	3.50
14	Shaanxi	11,812	2.70
15	Jiangxi	11,257	2.57
16	Liaoning	10,561	2.41
17	Chongqing	10,539	2.41
18	Yunnan	10,496	2.40
19	Guangxi	9,510	2.17
20	Shanxi	8,984	2.05
21	Neimenggu	8,610	1.97
22	Guizhou	7,311	1.67
23	Xinjiang	6,687	1.53
24	Tianjin	5,851	1.34
25	Heilongjiang	5,553	1.27
26	Jilin	4,731	1.08
27	Gansu	4,148	0.95
28	Hainan	2,640	0.60
29	Ningxia	1,858	0.42
30	Qinghai	1,328	0.30
31	Xizang	837	0.19
total		437,335	100.00

Source: China Health Statistical Yearbook (2022)

3.2.2 Sample

3.2.2.1Quantitative Research

The sample size was calculated using Taro Yamane's formula (1967) at a 95% confidence level, resulting in a required sample of 399 participants. To ensure sufficient responses, 450 questionnaires were distributed.

$$n = \frac{\mathrm{N}}{1 + \mathrm{N}e^2}$$

where

n = sample size

N = population size

e = Probability of allowable error

$$n = \frac{437335}{1 + 437335(0.05)^2}$$

n = 399

Based on the number of the population in Table 3.1, the stratified sampling technique was used to select the sample for this research by province. The provinces with a minimum of 10,000 surgeons were considered, and only 18 provinces (numbers 1 to 18) were used and became the majority of the population (84.44%) and the representative of the whole population. Next, this study adopted a proportion sampling strategy for questionnaire distribution by provinces, as seen in Table 3.2. Ultimately, the purposive sampling method was employed to identify the sample for this research endeavor in order to fulfill the study's objectives. Specifically, only surgeons with more than 3 years of experience in surgery were selected to complete the questionnaire. Moreover, the rest of the provinces (numbers 19 to 31) in Table 3.1 was reserved for the pretest.

Table 3.2

Number of Questionnaires Distributed by Provinces

Ranking	Provinces	Number of Surgeons	%	Accumulation	Number of questionnaires
1	Guangdong	47,433	10.85	10.85	58
2	Jiangsu	44,827	10.25	21.10	55
3	Shandong	32,188	7.36	28.46	39
4	Zhejiang	28,861	6.60	35.06	35
5	Sichuang	21,023	4.81	39.86	26
6	Henan	20,673	4.73	44.59	25
7	Hubei	19,510	4.46	49.05	24
8	Fujian	19,003	4.35	53.40	23
9	Hunan	17,485	4.00	57.39	21
10	Shanghai	16,508	3.77	61.17	20
11	Anhui	16,449	3.76	64.93	20
12	Hebei	15,363	3.51	68.44	19
13	Beijing	15,299	3.50	71.94	19
14	Shaanxi	11,812	2.70	74.64	14
15	Jiangxi	11,257	2.57	77.22	14
16	Liaoning	10,561	2.41	79.63	13
17	Chongqing	10,539	2.41	82.04	13
18	Yunnan	10,496	2.40	84.44	13

Source： Researcher (2024).

3.2.2.2 Qualitative Research

The number of key informants was considered based on some scholars' opinions. Bekele and Ago (2022) said that in-depth interviews involve a small number of participants, ranging from 5-30 participants. Nevertheless, the objective of conducting in-depth interviews is not to attain statistical significance; rather, it is to procure a profound comprehension of the research subject matter via comprehensive and nuanced data accumulation. Consequently, the determination of the sample size ought to be predicated on the saturation threshold, which signifies the juncture at which the introduction of new data ceases to yield further insights pertaining to the research inquiry. Saturation can be reached after interviewing as few as 5 participants or as many as 30 participants. Gaskin et al. (2010) advocate for the conduct of 10–30 interviews that yield a total of 75–150 statements from the clientele. Furthermore, Greg Guest et al. (2006) concluded from an ethnographic study that they created 97% of their research codes within 12 interviews and 94% in the first 6.

Therefore, the researcher considered interviewing 12 key informants. The samples selected as key responders or informants were chosen from surgeons in hospitals, hospital leaders, and government offices from the Health and Wellness Committee in China, as illustrated in Table 3.3. The three types of interviewees were selected for the following reasons: First, as the primary subjects of the study, surgeons' insights are crucial for understanding how leadership development directly influences their innovation behaviors and psychological empowerment in daily practice. Secondly, hospital leaders' perspectives are valuable in providing an institutional context, as they can highlight how leadership training is implemented and how it supports or hinders surgeons' innovation efforts. Finally, officials from the healthcare administration offer a broader policy-level perspective on leadership development programs and their alignment with national healthcare priorities, providing an understanding of how external factors shape innovation in surgical settings. The 12 interviewees were randomly selected from 18 provinces.

Table 3.3

The Number of Purposive Selections for Qualitative Research

No.	Key Informants	Number of Samples
1	Surgeon	8
2	Hospital Leaders	2
3	Government Health Officials	2

Source： Researcher (2024).

The qualitative component involved 12 key informants selected based on data saturation principles. The sample included:

1. Surgeons (8 participants): to provide firsthand insights into leadership development and innovation.
2. Hospital Leaders (2 participants): to offer institutional perspectives on leadership training.
3. Government Officials (2 participants): to discuss policy-level influences on leadership and innovation.

3.3 Research Tools

3.3.1 Quantitative Research

The research tool was a questionnaire to measure the variables in this study. The questionnaire is separated into 5 parts as follows:

Part 1: General information of the respondents

It includes province, gender, age, job title, monthly salary, marital status, education level, nature of the hospital, grade of the hospital, and years of service.

Part 2: The opinions and attitudes of surgeons towards leadership development. The answers are based on the five-point rating scale from "strongly agree" to "strongly disagree", and the rating scale is as follows:

Level	Score
Strongly Agree	5
Agree	4
Neural	3
Disagree	2
Strongly Disagree	1

The meaning of each score would be

Score 5 means respondents strongly agree with the statement

Score 4 means respondents agree with the statement

Score 3 means respondents neither agree nor disagree with the statement

Score 2 means respondents disagree with the statement

Score 1 means respondents strongly disagree with the statement

The interpretation of the score is as follows (Best, 1981, p. 182):

Mean	Significance Level
1.00 - 1.80	Strongly Disagree
1.81 - 2.60	Disagree
2.61 - 3.40	Neutral
3.41 - 4.20	Agree
4.21 - 5.00	Strongly Agree

Part 3: The opinions and attitudes of surgeons towards innovation. The answers will be based on the five-point rating scale from Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree.

Part 4: The opinions and attitudes of surgeons towards Psychological empowerment. The answers are based on the five-point rating scale from Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree.

Part 5: Suggestions by open-ended questions.

3.3.2 Qualitative Research

A semi-structured interview framework was formulated to enable a comprehensive examination of the research themes. The guide allowed flexibility to adapt questions during interviews, ensuring comprehensive data collection (Adeoye - Olatunde & Olenik, 2021). This research used an in-depth interview form (semi-structured). A Consent form was constructed and used to interview key informants from surgeons in the hospital, hospital leaders, and government officers from the Health and Wellness Committee in China.

3.4 Data Collection Strategy and Procedure

3.4.1 Questionnaire Design Process and Data Collection

Design Process

1) Review literature to define the conceptual framework.
2) Create a questionnaire to serve the research objectives.
3) Use IOC (Item Objective Congruence Index) to check Content Validity and seek comments from the following 5 specialists
    1. Dr.Guan Yongjun, dean and professor at the School of Economics and Management, Guangxi University of Science and Technology
    2. Dr.Liao Zhigao, dean and professor at the Graduate School of Guangxi University of Science and Technology
    3. Dr. Zhu Xin, director of the Development and Planning Office and professor at Guangxi University of Science and Technology
    4. Dr. Liang Feiwen, associate dean and associate professor at the School of Economics and Management, Guangxi University of Science and Technology
    5. Li Zongcai, associate chief physician at Qinhuai Medical Area of the General Hospital of the Eastern Warzone of the Chinese People's Liberation Army

$$IOC = \frac{\Sigma R}{n}$$

where IOC = Index of item-objective congruence value

R = Score from experts

ΣR = Total score from all experts

n = number of experts

Criteria to verify the score are

+1 means "the measurement item is congruent with the objective of the study"

0 means "the measurement item is undecided with the objective of the study"

-1 means "the measurement item is inconsistent with the objective of the study."

The IOC needs to be between 0.5-1.00 for every question.

4) Find the mean of the IOC and use the following judgment

Means between 0.5-1.00 means "the measurement is passing the criteria from experts"

Means below 0.5 means "the measurement needs to be changed or corrected."

Less than 0 means "the measurement is failing to meet the standards of experts."

In this study, 5 experts were invited to score the questionnaire items, and the results showed that the IOC value of each item was between 0.5-1.00, which met the content validity criteria.

5) Conduct a pretest with 30 participants to assess reliability (Cronbach's alpha).The formula of Cronbach's alpha coefficient is

$$\alpha = \left[\frac{n}{(n-1)}\right]\left[1 - \frac{\sum_{i=0}^{n}/S_i^2}{S_t^2}\right]$$

where α = a coefficient of reliability

n = the number of informants

$\sum_{i=0}^{n}$ = the variance of the sum of informants

S_i^2 = the ratio of the variance of each informant

S_t^2 = the ratio of inter-informants' variance

In order to improve the accuracy of pre-test results, 30 pre-test questionnaires were actually collected in this study. The Cronbach's Alpha coefficients across ten dimensions pertaining to the three variables assessed in the survey exhibited a range from 0.850 to 0.892, with all values surpassing the threshold of 0.7. This observation signifies a robust internal consistency of the questionnaire scale, thereby affirming its suitability for application in scholarly research.

6) Update the questionnaire to distribute to the samples.

Data Collection

The following steps were exercised.

1) Request a letter from the Management department for permission to distribute the questionnaire.
2) Distribute the final questionnaire via an online platform (WJX.cn) together with the letter above to the HR department of each target hospital.
3) Collect and verify completed questionnaires within the specified timeline, having the number of completed issues and the percentage that could be used for further analysis.
4) At last, the database was generated by AMOS.

3.4.2 Interview Design Process and Data Collection

Design Process

1) Obtain consent from key informants.
2) Conduct interviews with surgeons, hospital leaders, and government officials.
3) Record, transcribe, and analyze qualitative data to identify emerging themes.

3.5 Data Analysis

Step 1: To analyze quantitative data, the following steps were applied:

1) Analyze the general information of the respondents by Frequency and Percentage.
2) Analyze the central position of a variable within a set of data by the Mean. Therefore, judge the representativeness of the mean by the Standard Deviation (SD).
3) Analyze the relationships among variables by Correlation Coefficient or Pearson Correlation (r).
4) Analyze the Coherence between variables by Multicollinearity through Correlation Analysis.
5) Analyze the factors using Structural Equation Modeling by AMOS to pass the criteria of factor loading values for the questionnaire quality.

Confirmatory factor analysis (CFA) constitutes a rigorous statistical examination of data derived from social surveys. It tests whether the relationship between a factor and the corresponding measure term conforms to the theoretical relation designed by the researcher.

The frequently employed statistical metrics in the assessment of model fitting encompass the Chi-square fitting statistic (χ^2), the comparative fit index (CFI), the goodness-of-fit index (GFI), and the root mean square error of approximation (RMSEA). CFA is used to verify the dimensionality of the scale, or the factor structure, to determine the most effective factor structure, to test the hierarchical relationship of the verification factors, and to evaluate the reliability and validity of the scale. CFA is often tested by structural equation modeling.

Step 2: Qualitative Data Analysis

The qualitative data were subjected to thematic analysis, utilizing a coding framework to discern patterns and interrelations. Themes were cross-referenced with quantitative findings for triangulation.

3.6 Research Ethics

The researcher completed ethics training and obtained certification (Certification Number: 2991174) from the Protecting Human Research Participants Online Training SBE from PHRP Online Training, Inc. Ethical approval for the study was sought before initiating data collection. Participants' confidentiality and informed consent were prioritized throughout the research process. This research got ethics approval, and the Approval No. was: 004/2568 from the Ethics Committee for Human Research, Southeast Asia University.

CHAPTER 4
RESEARCH RESULTS

This study utilizes SPSS 26 and AMOS 23 for quantitative data analysis, including descriptive statistical analysis, reliability and validity tests, and structural equation modeling. Additionally, in-depth interviews were used as an effective supplement to the questionnaire survey. The details in this chapter are separated into 7 parts as follows:

4.1 Questionnaire Design
4.2 Basic Information Analysis of Questionnaire Data
4.3 Descriptive Analysis of Empirical Research on Survey Subjects
4.4 Reliability, Validity, and Primary Confirmatory Factor Analysis
4.5 The Structural Equation Models and Hypothesis Testing
4.6 In-depth Interview Data Analysis
4.7 Combination of Quantitative Analysis Results and Qualitative Analysis Results

This chapter presents the research findings based on the data collected. This study emphasizes the interconnections among Leadership Development (LD), Psychological Empowerment (PE), and Innovation Behaviors (IB). The analytical procedures were executed utilizing descriptive statistical analysis through SPSS as well as Structural Equation Modeling (SEM) employing Amos.

4.1 Questionnaire Design

To ensure the reliability and validity of the scale, this research meticulously designed the questionnaire based on a range of observation variables, aiming to uphold its logical coherence and rationality. This survey questionnaire is divided into 5 parts as follows:

The first part is Personal Information: including gender, age, marital status, education level, nature of the hospital, grade of the hospital, job title, monthly salary, and years of service.

The second part is the scale of Leadership Development. Questions No. 1-5 represent the dimension of strategic thinking, 6-10 represent the dimension of communication, 11-15 represent the dimension of motivation, and 16-20 represent the dimension of training.

The third part is the scale of Psychological Empowerment. Questions No. 21-25 represent the dimension of meaning, 26-30 represent the dimension of self-determination, 31-35 represent the dimension of self-efficacy, 36-40 represent the dimension of impact.

The fourth part is the scale of Innovation Behaviors. Questions No. 41-45 represent the dimension of idea generation, and 46-50 represent the dimension of idea realization.

The last part is Recommendation.

The symbols representing variables and the number of items for the questionnaire are shown in Table 4.1.

Table 4.1

Symbols Representing Variables

Latent Variables	Observed Variables	Number of Items
Leadership Development (LD)	Strategic Thinking (ST)	5 (ST1-5)
	Communication (CO)	5 (CO1-5)
	Motivation (MO)	5 (MO1-5)
	Training (TR)	5 (TR1-5)
Psychological Empowerment (PE)	Meaning (ME)	5 (ME1-5)
	Self-determination (SD)	5 (SD1-5)
	Self-efficacy (SE)	5 (SE1-5)
	Impact (IM)	5 (IM1-5)

Innovation Behaviors (IB)	Idea Generation (IG)	5 (IG1-5)
	Idea Realization (IR)	5 (IR1-5)

4.2 Basic Information Analysis of Questionnaire Data

The descriptive analysis of sample characteristics analyzes the sample's basic information. In this study, 452 valid questionnaires were gathered and evaluated, with descriptive data reported in Table 4.2 (items 1-9) and Table 4.3 (item 5).

Table 4.2

Sample Feature Description (Items 1-4,6-10) (n =452)

Item No.	Variables	Item	Number	Percentage
1	Gender	Male	366	80.97%
		Female	86	19.03%
2	Age	25 - 34	83	18.36%
		35 - 44	169	37.39%
		45 - 54	114	25.22%
		55 - 59	56	12.39%
		Above 60	30	6.64%
3	Marital Status	Single	75	16.59%
		Married	377	83.41%
4	Education Level	Under Bachelor Degree	42	9.29%
		Bachelor's Degree or even	281	62.17%
		Postgraduate	129	28.54%
5	Nature of the Hospital	Public	383	84.73%
		Private	69	15.27%

Item No.	Variables	Item	Number	Percentage
6	Grade of the Hospital	Tertiary Hospital	205	45.35%
		Secondary Hospital	157	34.73%
		First-class Hospital	77	17.04%
		Unrated	13	2.88%
7	Job Title	Resident Physician	97	21.46%
		Attending Physician	208	46.02%
		Associate Chief Physician	106	23.45%
		Chief Physician	41	9.07%
8	Monthly Salary (CNY)	Below 5,000	27	5.97%
		5,001 - 10,000	178	39.38%
		above 10,001	247	54.65%
9	Years of Service	3-5 years	83	18.36%
		5- 10 years	102	22.57%
		above 10 years	267	59.07%

Sample Characterization analysis for items 1-9 can be shown in Table 4.2 above. The findings of the survey reveal that 80.97% of the respondents are male, whereas 19.03% are female. Regarding age distribution, the largest group falls within the 35-44 age range, accounting for 169 individuals or 37.39%. The second-largest demographic cohort consists of individuals within the age range of 45 to 54 years, encompassing 114 respondents, which constitutes 25.22% of the total sample, followed closely by those within the age range of 25 to 34 years, which accounts for a total of 83 respondents or 18.36%. In terms of marital status, a significant majority of 83.41% are married, while the remaining 16.59% classify themselves as single. Regarding educational level, the majority hold a bachelor's degree or even, with 281 respondents or 62.17%, followed by those with a postgraduate degree,

comprising 129 respondents or 28.54%. Regarding the nature of hospitals, there are 383 public hospitals, 84.73%, and 69 private hospitals, accounting for 15.27%. Regarding the grade of the hospital, tertiary hospitals comprise the highest proportion at 205, or 45.35%, secondary hospitals 34.73%, first-class hospitals 17.04%, and Unrated 2.88%. Regarding job title, there were 208 attending physicians, accounting for the most significant proportion, 46.02%; the second was Associate Chief Physician, accounting for 23.45%; the proportion of resident physicians was 21.46%. Besides, 247 respondents or 54.65% get 10,001 CNY for their monthly salary. Furthermore, a total of 267 respondents, representing 59.07%, had accumulated over a decade of professional experience, while 102 respondents, accounting for 22.57%, had engaged in employment for a duration ranging from five to ten years.

The Percentage of provinces for item 5 is shown in Table 4.3.

Table 4.3

Percentage of Province (Item 5)

Province	Number of questionnaires	Percentage
Guangdong	58	12.83%
Jiangsu	55	12.71%
Shandong	39	8.63%
Zhejiang	35	7.74%
Sichuan	26	5.75%
Henan	25	5.53%
Hubei	24	5.31%
Fujian	23	5.09%
Hunan	21	4.65%
Shanghai	20	4.42%
Anhui	20	4.42%
Hebei	19	4.2%
Beijing	19	4.2%

Province	Number of questionnaires	Percentage
Shaanxi	14	3.1%
Jiangxi	14	3.1%
Chongqing	14	3.1%
Liaoning	13	2.88%
Yunnan	13	2.88%

Sample Characterization analysis for item 5 is shown in Table 4.3 above. The survey results indicate that 12.83% of respondents are from Guangdong, accounting for the most significant proportion. Jiangsu Province followed it with 12.71%. Yunnan and Liaoning provinces had the fewest respondents, both at 2.88%.

4.3 Descriptive Analysis of Empirical Research on Survey Subjects

4.3.1 Distribution of Factors on Leadership Development

This section presents the informants' perceptions of leadership development, which comprises four dimensions of Strategic Thinking, Communication, Motivation, and Training.

The results for the dimension of strategic thinking are displayed in Table 4.4.

Table 4.4

Analysis of Strategic Thinking

No	Statement	$\overline{X}$	SD.	Level	Rank No
1	I can identify long-term trends and opportunities for innovation in surgery.	3.86	1.207	Agree	2
2	I develop clear surgical strategies and follow-up plans when faced with complex surgical decisions.	3.88	1.218	Agree	1
3	I can incorporate clinical data and scientific advances to develop innovative surgical programs.	3.85	1.302	Agree	3
4	I regularly evaluate and adjust my team's work plan to meet new challenges and needs.	3.81	1.275	Agree	4

No	Statement	$\overline{X}$	SD.	Level	Rank No
5	I can summarize lessons learned during surgical procedures into new clinical pathways or guidelines.	3.80	1.326	Agree	5
	Total	3.84	1.265	Agree	

According to the data presented in Table 4.4, the mean score associated with strategic thinking is 3.84, with values varying from 3.80 to 3.88, signifying levels of agreement. The calculated average standard deviation (SD) is 1.26. The highest mean score, 3.88, suggests that most surgeons can develop clear surgical strategies and follow-up plans when faced with complex surgical decisions. Conversely, the lowest mean score, 3.80, indicates that the ability to apply learned experiences into formalized practices may not be as strongly developed compared to other aspects of strategic thinking in leadership development.

The results for the dimension of communication are shown in Table 4.5.

Table 4.5

Analysis of Communication

No	Statement	$\overline{X}$	SD.	Level	Rank No
1	I can clearly explain complex surgical procedures and the rationale for decisions to team members.	3.89	1.320	Agree	1
2	I can actively listen to team members and incorporate their suggestions in pre-operative discussions.	3.84	1.264	Agree	3
3	I can communicate effectively with team members during surgery to ensure a smooth operation.	3.82	1.222	Agree	4
4	I can constructively communicate and mediate when team members disagree in post-operative discussions.	3.85	1.363	Agree	2

No	Statement	$\overline{X}$	SD.	Level	Rank No
5	I can use appropriate communication styles to improve team collaboration and departmental efficiency.	3.80	1.287	Agree	5
	Total	3.84	1.287		

From Table 4.5, the mean score pertaining to communication is 3.84, with values fluctuating between 3.80 and 3.89, signifying levels of agreement. The average standard deviation (SD) is calculated to be 1.28. The highest mean score, 3.89, suggests that most surgeons feel confident in their ability to effectively communicate complex surgical procedures and the reasoning behind their decisions to team members. Conversely, the lowest mean score, 3.80, indicates that the ability to adapt communication styles for enhancing teamwork and efficiency may not be as strongly developed compared to other aspects of communication in leadership development.

The results for the dimension of motivation are shown in Table 4.6.

Table 4.6

Analysis of Motivation

No	Statement	$\overline{X}$	SD.	Level	Rank No
1	I can motivate team members through clear division of labor and goal setting.	3.86	1.286	Agree	4
2	I always recognize team members' efforts and contributions after surgery to motivate them.	3.87	1.265	Agree	3
3	I arrange appropriate surgical tasks and learning opportunities according to the abilities and strengths of my team members.	3.88	1.280	Agree	2
4	I recognize team members' needs and provide targeted feedback and coaching.	3.86	1.334	Agree	4
5	I maintain team motivation and energy by creating challenging and meaningful work assignments.	3.89	1.277	Agree	1
	Total	3.87	1.288		

From Table 4.6, the average score related to motivation is 3.87, with scores ranging from 3.86 to 3.89, indicating agree levels. The average standard deviation (SD) is 1.28. The highest mean score, 3.89, suggests that most surgeons feel confident in their ability to motivate and energize their teams by assigning challenging and meaningful tasks. Conversely, the lowest mean score, 3.86, indicates that in terms of motivating team members, primarily through clear division of labor, goal setting, and providing targeted feedback and coaching, surgeons may need to develop these leadership skills further to enhance team motivation and collaboration effectiveness.

The results for the dimension of training are shown in Table 4.7.

Table 4.7

Analysis of Training

No	Statement	$\overline{X}$	SD.	Level	Rank No
1	I can attend leadership programs and related training regularly to enhance my overall competencies.	3.89	1.301	Agree	2
2	I encourage my team members to participate in various business skills training.	3.90	1.314	Agree	1
3	I will apply innovative ideas and practices learned in training to surgical procedures.	3.88	1.311	Agree	3
4	Regular training and updating skills are important to maintain a high level of surgical practice.	3.86	1.355	Agree	4
5	I actively participate in simulated surgery and reflective learning to continually improve clinical and leadership skills.	3.86	1.424	Agree	4
Total		3.88	1.341		

From Table 4.7, the average score related to training is 3.88, with scores ranging from 3.86 to 3.90, indicating agree levels. The average standard deviation (SD) is 1.34. The highest mean score, 3.90, suggests that most surgeons feel confident in encouraging team members to engage in training programs to improve business skills.. Conversely, the lowest mean score, 3.86, indicates that while surgeons recognize the importance of regular training

and skill updates, there may be barriers or insufficient motivation to actively engage in activities such as simulated surgery and reflective learning.

4.3.2 Distribution of Factor on Psychological Empowerment

This section presents the informants' perceptions of psychological empowerment, which comprises four dimensions: Meaning, Self-determination, Self-efficacy, and Impact.

The results for the dimension of meaning are displayed in Table 4.8.

Table 4.8

Analysis of Meaning

No	Statement	$\overline{X}$	SD.	Level	Rank No
1	The work I do is significant to me.	3.84	1.430	Agree	3
2	What I do at work is very meaningful to me personally.	3.87	1.525	Agree	2
3	My work is vital to me.	3.78	1.439	Agree	5
4	I feel that my work is full of personal value and meaning.	3.81	1.388	Agree	4
5	My work is consistent with my personal goals and values.	3.89	1.487	Agree	1
Total		3.84	1.453		

From Table 4.8, the average meaning-related score is 3.84, with scores ranging from 3.78 to 3.89, indicating agree levels. The average standard deviation (SD) is 1.45. The highest mean score, 3.89, suggests that most surgeons believe their work aligns with their personal goals and values. Conversely, the lowest mean score, 3.78, indicates that some surgeons have a relatively weak perception of the meaning of their work or feel that the importance of their work is not fully recognized.

The results for the dimension of self-determination are shown in Table 4.9.

Table 4.9

Analysis of Self-determination

No	Statement	$\overline{X}$	SD.	Level	Rank No
1	I can decide for myself how to proceed with my work.	3.81	1.327	Agree	4
2	I have great independence and autonomy in how I do my job.	3.91	1.334	Agree	1
3	I have much autonomy in deciding how to accomplish my work.	3. 82	1.360	Agree	3
4	I can independently set work objectives and plan a path to achieve them.	3.87	1.303	Agree	2
5	I have the right to choose the techniques and methods used in my work.	3.81	1.235	Agree	4
Total		3.84	1.315		

From Table 4.9, the average score related to self-determination is 3.84, with scores ranging from 3.81 to 3.91, indicating agree levels. The average standard deviation (SD) is 1.31. The highest mean score, 3.91, suggests that most surgeons feel they have high independence and autonomy in their work. Conversely, the lowest mean score, 3.81, indicates that although surgeons have some degree of autonomy in their work, they are still subject to certain external constraints when deciding how to proceed with their tasks and choosing the techniques and methods used.

The results for the dimension of self-efficacy are shown in Table 4.10.

Table 4.10

Analysis of Self-efficacy

No	Statement	$\overline{X}$	SD.	Level	Rank No
1	I have acquired the skills needed to perform my job.	3.84	1.346	Agree	2
2	I am confident in my ability to do the things I do on the job.	3.79	1.462	Agree	5

No	Statement	$\overline{X}$	SD.	Level	Rank No
3	I am very confident in my ability to do my job.	3.85	1.291	Agree	1
4	I am confident that I can overcome difficulties and challenges on the job.	3.81	1.389	Agree	4
5	I feel that I can perform complex and important tasks efficiently.	3.82	1.368	Agree	3
	Total	3.82	1.371		

From Table 4.10, the average score related to self-efficacy is 3.82, with scores ranging from 3.79 to 3.85, indicating agreement levels. The average standard deviation (SD) is 1.37. The highest mean score, 3.85, suggests that most surgeons are confident in their ability to perform their job and believe they can complete tasks efficiently. Conversely, the lowest mean score, 3.79, indicates that surgeons may feel less confident in this particular task or uncertain about their abilities in certain aspects of their daily work.

The results for the dimension of impact are shown in Table 4.11.

Table 4.11

Analysis of Impact

No	Statement	$\overline{X}$	SD.	Level	Rank No
1	I have a great deal of influence over what happens in my department.	3.77	1.403	Agree	5
2	I have a great deal of control over what happens in my department.	3.78	1.421	Agree	3
3	I have a significant influence on what happens in my department.	3.81	1.294	Agree	4
4	My input is important in the department's decision-making process.	3.79	1. 321	Agree	1
5	My work product significantly affects the overall performance of the department.	3.78	1.405	Agree	2
	Total	3.79	1.368		

From Table 4.11, the average score related to impact is 3.79, with scores ranging from 3.77 to 3.81, indicating agree levels. The average standard deviation (SD) is 1.368. The highest mean score, 3.81, suggests that surgeons believe they have an important impact on departmental affairs and can play a role in certain decisions and critical moments.. Conversely, the lowest mean score, 3.77, indicates that although surgeons feel they have some influence over the department, they may perceive their influence as not as strong as expected, possibly constrained by other forces within the department.

4.3.3 Distribution of Factor on Innovation Behaviors

This section presents the informants' perceptions of innovation behavior, comprising two dimensions: idea generation and idea realization.

The results for the dimension of idea generation are displayed in Table 4.12.

Table 4.12

Analysis of Idea Generation

No	Statement	$\overline{X}$	SD.	Level	Rank No
1	I will explore opportunities to improve surgical methods, techniques, or post-operative care.	3.82	1.364	Agree	5
2	I will focus on non-routine surgical procedures, safety, and healthcare problems.	3.84	1.480	Agree	2
3	I will develop ideas or solutions to problems.	3.81	1.495	Agree	1
4	I will look at problems from different perspectives to gain deeper insights.	3.90	1.335	Agree	4
5	I will test new technologies and treatments to understand unmet needs.	3.87	1.269	Agree	3
Total		3.85	1.388		

From Table 4.12, the average score related to impact is 3.85, with scores ranging from 3.81 to 3.90, indicating agree levels. The average standard deviation (SD) is 1.38. The highest mean score, 3.90, suggests surgeons exhibit flexible thinking and a deep understanding of complex problems. Conversely, the lowest mean score, 3.81, indicates

that surgeons tend to rely more on existing methods or experiences when solving problems, rather than actively seeking new, creative solutions.

The results for the dimension of idea realization are shown in Table 4.13.

Table 4.13

Analysis of Idea Realization

No	Statement	$\overline{X}$	SD.	Level	Rank No
1	I will evaluate the advantages and disadvantages of new technologies and treatments.	3.85	1.275	Agree	3
2	I will try to convince others of the importance of a new technology or treatment.	3.90	1.442	Agree	1
3	I will take the initiative to promote the new technology or treatment and make it available for implementation.	3.89	1.460	Agree	2
4	I will take risks to support new technologies or treatments.	3.89	1.374	Agree	2
5	When applying a new technique to a patient's surgery, I will try to fix the problems created by the new method.	3.84	1.389	Agree	4
Total		3.87	1.389		

From Table 4.13, the average score related to impact is 3.87, with scores ranging from 3.84 to 3.90, indicating agree levels. The average standard deviation (SD) is 1.38. The highest mean score, 3.90, suggests that most surgeons are willing to actively try to convince others to accept and value new technologies or treatments when driving innovation. Conversely, the lowest mean score, 3.84, indicates that although most surgeons are willing to resolve problems caused by new methods when applying new techniques, they may experience some difficulties or uncertainties.

4.4 Reliability, Validity, and Primary Confirmatory Factor Analysis

The fundamental analysis in this research is to test the validity and reliability. Upon the completion of data collection, the information was subjected to rigorous analysis employing the principles of Confirmatory Factor Analysis (CFA) to assess and refine the model's validity in accordance with data derived from a total of 452 samples. The CFA used the AMOS program to evaluate observable variables: leadership development, psychological empowerment, and innovation behaviors. For the analysis, the researcher calculated the fitness for CFA, standard regression weight (λ), and construct reliability for each factor load.

4.4.1 Measurement Model

After the data were collected, they were analyzed using the elements of CFA. The sample of 452 surgeons is illustrated in three latent variables as follows.

Leadership development has four factors loading in the questionnaire as follows: (1)ST (Strategic Thinking), (2) CO (Communication), (3) MO (Motivation), and (4) TR (Training). All constructs with a factor loading value are shown in Table 4.14.

Table 4.14

Factor Loading of LD in Measurement Model

Path relationship			Estimate
ST1	<---	Strategic Thinking	0.777
ST2	<---	Strategic Thinking	0.758
ST3	<---	Strategic Thinking	0.816
ST4	<---	Strategic Thinking	0.817
ST5	<---	Strategic Thinking	0.792
CO1	<---	Communication	0.809
CO2	<---	Communication	0.834
CO3	<---	Communication	0.796
CO4	<---	Communication	0.884
CO5	<---	Communication	0.820
MO1	<---	Motivation	0.803

Path relationship			Estimate
MO2	<---	Motivation	0.803
MO3	<---	Motivation	0.831
MO4	<---	Motivation	0.839
MO5	<---	Motivation	0.824
TR1	<---	Training	0. 812
TR2	<---	Training	0.796
TR3	<---	Training	0.833
TR4	<---	Training	0.872
TR5	<---	Training	0.901

Psychological empowerment presents four factors loading in the questionnaire as follows: (1) ME (Meaning), (2) SD (Self-determination), (3) SE (Self-efficacy), and (4) IM (Impact). All constructs with a factor loading value are shown in Table 4.15.

Table 4.15

Factor Loading of PE in Measurement Model

Path relationship			Estimate
ME1	<---	Meaning	0.850
ME2	<---	Meaning	0.912
ME3	<---	Meaning	0.879
ME4	<---	Meaning	0.853
ME5	<---	Meaning	0.895
SD1	<---	Self-determination	0.817
SD2	<---	Self-determination	0.826
SD3	<---	Self-determination	0.872
SD4	<---	Self-determination	0.797
SD5	<---	Self-determination	0.796
SE1	<---	Self-efficacy	0.857
SE2	<---	Self-efficacy	0.907
SE3	<---	Self-efficacy	0.865

Path relationship			Estimate
SE4	<---	Self-efficacy	0.815
SE5	<---	Self-efficacy	0.847
IM1	<---	Impact	0.854
IM2	<---	Impact	0.839
IM3	<---	Impact	0.821
IM4	<---	Impact	0.831
IM5	<---	Impact	0.870

Innovation behavior presents four factors loading in the questionnaire: (1) IG (Ider generation), (2) IR (Idea realization). All constructs with a factor loading value are shown in Table 4.16.

Table 4.16

Factor Loading of IB in Measurement Model

Path relationship			Estimate
IG1	<---	Ider generation	0.864
IG2	<---	Ider generation	0.861
IG3	<---	Ider generation	0.885
IG4	<---	Ider generation	0.872
IG5	<---	Ider generation	0.831
IR1	<---	Idea realization	0.836
IR2	<---	Idea realization	0.924
IR3	<---	Idea realization	0.886
IR4	<---	Idea realization	0.842
IR5	<---	Idea realization	0.864

4.4.2 Reliability and Validity Analysis

The data were analyzed to assess convergent validity, which was determined using the value weighting factors derived from standardized regression weights obtained through confirmatory factor analysis. The standardized regression weight for each variable should be no less than 0.5. The reliability of the instruments was assessed through the application of Cronbach's alpha coefficient and the corrected item-total correlation (CITC). Items exhibiting a CITC value below the threshold of 0.3 warrant consideration for exclusion, whereas items with a CITC that surpass this benchmark may be retained. In the context of Cronbach's alpha, a coefficient that surpasses 0.8 is classified as indicative of high reliability; a coefficient ranging from 0.7 to 0.8 is deemed good; a coefficient between 0.6 and 0.7 is acknowledged as acceptable; and a coefficient falling below 0.6 is regarded as unsatisfactory (Nunnally & Bernstein, 1994). To substantiate convergent validity, the average variance extracted (AVE) must exceed 0.5 (Fornell & Larcker, 1981), albeit it is permissible for the AVE to be below 0.5 provided that the composite reliability (CR) exceeds 0.6 (Hair, Hult, Ringle, & Sarstedt, 2017). The CR value should be at least 0.7 to indicate significant reliability or be considered acceptable if it meets or exceeds 0.6.

The reliability and validity of the measurement of leadership development are shown in Table 4.17.

Table 4.17

Reliability and Validity of Leadership Development (LD)

Variables	Components	Corrected Item Total Correlation (CITC)	Cronbach's Alpha (> 0.7)	Average Variance Extracted (AVE ≧ 0.5)	Construct Reliability (CR ≧ 0.7)
Strategic Thinking (ST)	1	0.733	0.894	0.628	0.894
	2	0.712			
	3	0.753			
	4	0.764			

Variables	Components	Corrected Item Total Correlation (CITC)	Cronbach's Alpha (> 0.7)	Average Variance Extracted (AVE≧ 0.5)	Construct Reliability (CR≧0.7)
	5	0.734			
Communication (CO)	1	0.766	0.916	0.688	0.917
	2	0.799			
	3	0.761			
	4	0.830			
	5	0.772			
Motivation (MO)	1	0.758	0.911	0.673	0.911
	2	0.758			
	3	0.789			
	4	0.792			
	5	0.774			
Training (TR)	1	0.785	0.925	0.712	0.925
	2	0.763			
	3	0.789			
	4	0.826			
	5	0.854			

The CITC through the value of the corrected item-total correlation in the LD, which shows that the criterion in each equation has Cronbach's Alpha over 0.7. ST values from 0.712-0.764, with the reliability score at 0.894, average variance extracted (AVE) score at 0.628, and construct reliability (CR) score at 0.894. CO ranges from 0.761-0.830, with the reliability score at 0.916, average variance extracted (AVE) score at 0.688, and construct reliability (CR) score at 0. 917. The measurement of MO fluctuates within the interval of 0.758 to 0.792, accompanied by a reliability coefficient of 0.911, an average variance extracted (AVE) value of 0.673, and a construct reliability (CR) index of 0.911. Conversely, the measurement of TR varies between 0.763 and 0.854, presenting a reliability coefficient

of 0.925, an average variance extracted (AVE) value of 0.712, and a construct reliability (CR) index of 0.925. This means that there are no influential biases among factors. Those items in the LD questionnaire pass the criteria. Therefore, the LD measurement can be used in structural equation model analysis.

The reliability and validity of the measurement of psychological empowerment are shown in Table 4.18.

Table 4.18

Reliability and Validity of Psychological Empowerment (PE)

Variables	Components	Corrected Item Total Correlation (CITC)	Cronbach's Alpha (> 0.7)	Average Variance Extracted (AVE≧ 0.5)	Construct Reliability (CR≧0.7)
Meaning(ME)	1	0.821	0.944	0.771	0.944
	2	0.876			
	3	0.850			
	4	0.823			
	5	0.865			
Self-Determination (SD)	1	0.778	0.912	0.677	0.912
	2	0.777			
	3	0.821			
	4	0.758			
	5	0.750			
Self-Efficacy (SE)	1	0.820	0.933	0.734	0.932
	2	0.861			
	3	0.820			
	4	0.791			
	5	0.821			
	1	0.813	0.925	0.711	0.925

Variables	Components	Corrected Item Total Correlation (CITC)	Cronbach's Alpha (> 0.7)	Average Variance Extracted (AVE≧ 0.5)	Construct Reliability (CR≧0.7)
Impact (IM)	2	0.801			
	3	0.784			
	4	0.795			
	5	0.824			

The result from Table 4.18 shows the CITC through the value of the corrected item-total correlation in the PE, which shows that the criterion in each equation has Cronbach's Alpha over 0.7. ME values from 0.821-0.876, with the reliability score at 0.944, average variance extracted (AVE) score at 0.771, and construct reliability (CR) score at 0.944. SD ranges from 0.750-0.821, with the reliability score at 0.912, average variance extracted (AVE) score at 0.677, and construct reliability (CR) score at 0.912. SE ranges between 0.791-0.861, with the reliability score at 0.933, the average variance extracted (AVE) score at 0.734, and the construct reliability (CR) score at 0.932. IM ranges between 0.784-0.824, with a reliability score of 0.925, average variance extracted (AVE) score of 0.711, and construct reliability (CR) score of 0.925. This means that there are no influential biases among factors. Those items in the PE questionnaire pass the criteria. Therefore, the PE measurement can be used in structural equation model analysis.

The reliability and validity of the measurement of innovation behaviors are shown in Table 4.19.

Table 4.19

Reliability and Validity of Innovation Behaviors

Variables	Components	Corrected Item Total Correlation (CITC)	Cronbach's Alpha (> 0.7)	Average Variance Extracted (AVE≧ 0.5)	Construct Reliability (CR≧0.7)
Ider Generation (IG)	1	0.834	0.935	0.744	0.936
	2	0.826			
	3	0.843			
	4	0.836			
	5	0.802			
Idea Realization (IR)	1	0.804	0.940	0.759	0.940
	2	0.886			
	3	0.846			
	4	0.820			
	5	0.835			

The result from Table 4.19 shows the CITC through the value of the corrected item-total correlation in the IB, which shows that the criterion in each equation has Cronbach's Alpha over 0.7. IG values from 0.802-0.843, with the reliability score at 0.935, average variance extracted (AVE) score at 0.744, and construct reliability (CR) score at 0.936. IR ranges from 0.804-0.886, with the reliability score at 0.940, average variance extracted (AVE) score at 0.759, and construct reliability (CR) score at 0.940. Those items in the IB questionnaire pass the criteria. Therefore, the IB measurement can be used in structural equation model analysis.

This study aims to validate the constructs of the model (reliability and validity) in accordance with the proposed framework. The validity of the measurement model is assessed using the standardized factor loadings of each questionnaire item. Upon evaluating the measurement model, the results indicate that the model fits appropriately, confirming its adequacy for the intended analysis.

4.5 The Structural Equation Models and Hypothesis Testing

This study developed a set of hypotheses to clarify how various dimensions of leadership development influence innovation behavior. The empirical investigation was segmented into two principal components: structural analysis and path analysis. The objective of structural analysis is to evaluate the proposed conceptual framework and to scrutinize the relationships between the independent and dependent variables. In contrast, path analysis focuses on mapping and quantifying the causal relationships among variables by assessing the directional pathways within the model. Structural Equation Modelling (SEM) is employed to represent these relationships mathematically, where specific equations and numerical indicators define the analytical function of each construct. The resulting tables report key statistical outputs, including standardized path coefficients, significance levels (p-values), and R^2 values, indicating the proportion of variance explained. Emphasis is placed on those paths that achieve statistical significance within the proposed model.

The criteria for evaluating results in structural equation analysis are as follows: CMIN/DF should not exceed 5.00; IFI and CFI should be equal to or greater than 0.90; CFI should be equal to or greater than 0.70; PNFI and PCFI should approximate 1, and RMSEA must not surpass 0.08. All results adhere to these criteria, indicating a well-fitting structural model. Consequently, it suggests that the structural equations function as independent variables (LD), and mediating variable (PE), significantly impacting innovation behavior of surgeons in hospitals in China. This model aligns closely with empirical data.

The measurement model fits the theoretical model at an acceptable level. All values meet the criteria, indicating that the structural equations of the generated models had a very good fit (as seen in Table 4.20). This meets the fit measurement criteria as required.

Table 4.20

Model Fit Intercept (N=452)

No.	Model fit indicators	Threshold Range	Observed Values
1	Chi-square/df	Below 5, best below 3	1.599
2	RMSEA	Below 0.08	0.036
3	GFI	Above 0.9，0.8-0.9 Acceptable	0.862
4	CFI	Above 0.9，0.8-0.9 Acceptable	0.963
5	IFI	Above 0.9，0.8-0.9 Acceptable	0.963
6	NFI	Above 0.9	0.908
7	PNFI	Almost 1	0.861
8	PCFI	Almost 1	0.914

4.5.1 Validation of the Direct Effect

The path coefficient method was used in the model, and the p-value is indicated in Table 4.21. This can clarify the path of the impact of variables in the model as follows.

Table 4.21

Results of Structural Equation Modeling

Path relationship			Estimate	SE	CR	p	Estimates of Standardized Regression Weights
LD	→	PE	0.489	0.066	7.442	***	0.454
PE	→	IB	0.515	0.070	7.384	***	0.565
LD	→	IB	0.238	0.063	3.796	***	0.243

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

Based on AMOS's structural equation modeling output in Table 4.21 and Figure 4.1, the route coefficient of leadership development on psychological empowerment is 0.489. When leadership development increases by 1, psychological empowerment increases by 0.489. The regression weight estimates of 0.489 have a S.E. of around 0.066. Dividing the regression weight estimate by the standard error estimate yields z=0.489/0.066 = 7.442. In other words, the regression weight estimate is 7.442 (C.R.) standard errors above zero. Leadership development is a strong predictor of psychological empowerment, with a significant regression weight ($p < 0.001$, two-tailed). Standardized regression weight estimates (0.454) indicate that for every one standard deviation increase in leadership development, psychological empowerment increases by 0.454. These claims are roughly correct for large samples if appropriate assumptions are used.

The path coefficient for the impact of psychological empowerment on innovation behaviors is 0.515. The regression weight estimate has a standard error (S.E.) of around 0.085. The regression weight estimate is 7.384 (C.R.) standard errors above zero, with $p < 0.001$. The estimated standardized regression weights are 0.565.

The path coefficient for the impact of leadership development on innovation behaviors is 0.238. The regression weight estimate has a standard error (S.E.) of around 0.051. The regression weight estimate is 3.796 (C.R.) standard errors above zero, with $p < 0.001$. The estimated standardized regression weights are 0.243.

The data analysis demonstrates the relationships among leadership development, psychological empowerment, and innovation behaviors. The causal relationship among the variables is obvious. Figure 4.1 shows that the coefficient path responds directly to the variables' connection. The study's findings reveal that leadership development improves innovation behaviors (H1), and psychological empowerment of surgeons in hospitals in China (H2). It also demonstrated that psychological empowerment improves innovation behaviors of surgeons in hospitals in China (H3).

4.5.2 Validation of the Mediating Effect

To verify the mediating effect in the structural equation modeling, AMOS was used for the analysis, and the bootstrap mediating effect test was used to test whether the mediating effect was significant, as shown in Table 4.22.

Table 4.22

Results of Psychological Empowerment Mediating Effect Test

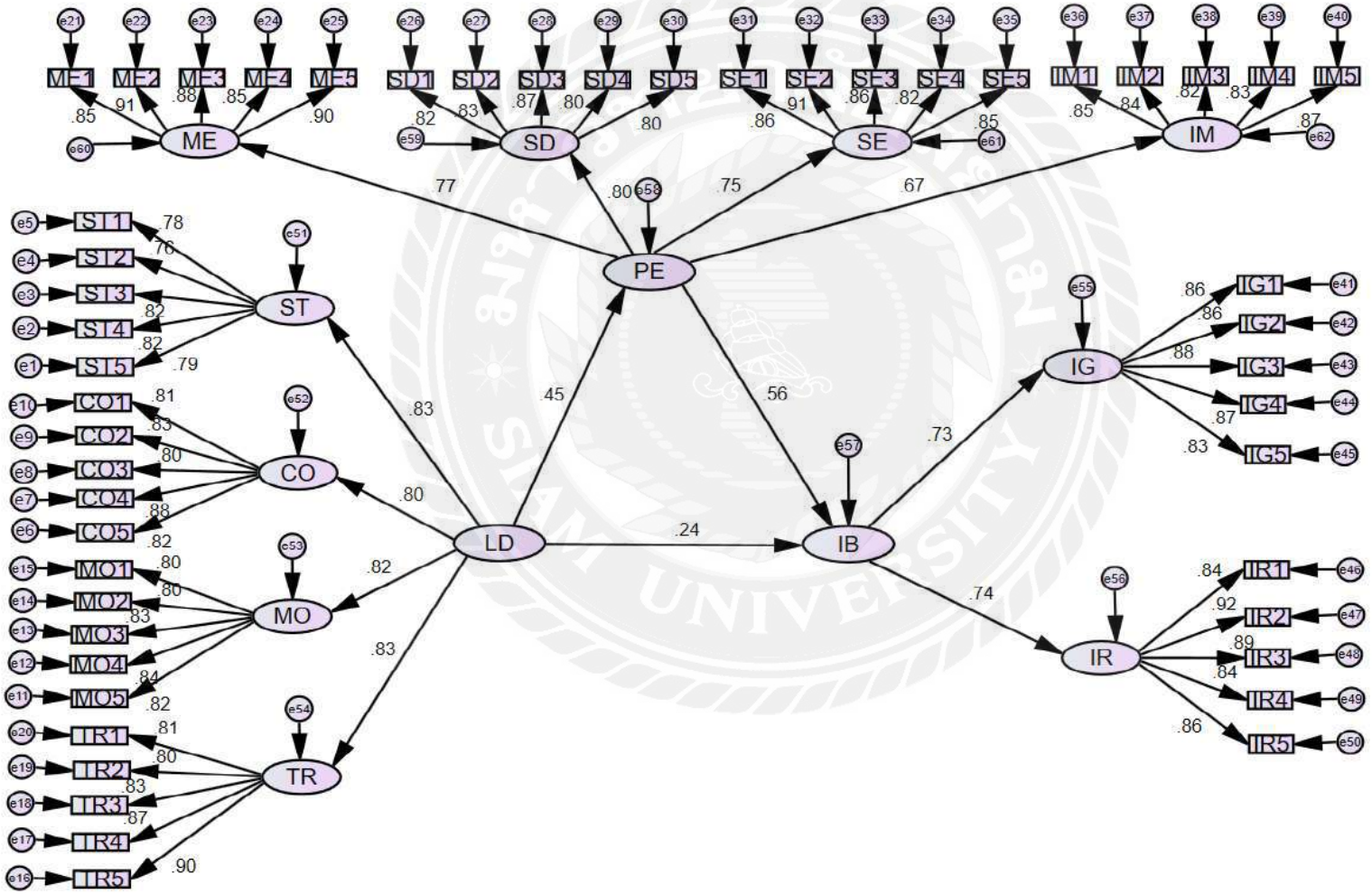
Effect	Path	Estimate	P	LLCI	ULCI	Percentage
Total effect	LD→IB	0.499	0.000	0.364	0.625	
Direct effect	LD→IB	0.243	0.001	0.095	0.389	0.49
Indirect effect	LD→PE→IB	0.257	0.000	0.168	0.352	0.51

The direct effect of leadership development on innovation behaviors was 0.234, with a 95% confidence interval not containing 0, indicating direct effect significance. Leadership development, psychological empowerment, and innovation behavior (LD→PE →IB) indirect effect is 0.257, and the 95% confidence interval does not include 0, indicating an indirect effect significance, in 51%. This indicates that psychological empowerment serves as a partial mediator in the relationship between leadership development and innovation behavior.

Therefore, by analyzing psychological empowerment, a variable in the total impact of leadership development on innovation behaviors, there is an indirect effect, and the result is significant. The psychological empowerment of surgeons in hospitals has a mediating effect of leadership development on innovation behavior (H4), hypothesis 4 is supported.

Figure 4.1

The Structural Equation Model



H1: Leadership Development has a direct effect on Surgeon Innovation Behaviors in hospitals in China. **(Accepted Hypothesis)**.

This hypothesis describes how Leadership Development affects Innovation Behaviors of surgeons in hospitals in China. Leadership Development has a strong impact on Innovation Behaviors (see Table 4.21). The paradigm is being used to examine Leadership Development in hospitals in China.

H2: Leadership Development has a direct effect on Psychological Empowerment of surgeons in hospitals in China. **(Accepted Hypothesis)**.

This hypothesis describes how Leadership Development affects Psychological Empowerment of surgeons in hospitals in China. Leadership Development has a strong impact on Psychological Empowerment (see Table 4.21). The paradigm is being used to examine the Psychological Empowerment of surgeons in hospitals in China.

H3: Psychological Empowerment has a direct effect on Surgeon Innovation Behaviors in hospitals in China. **(Accepted Hypothesis)**.

This hypothesis describes how Psychological Empowerment affects Innovation Behaviors of surgeons in hospitals in China. Psychological Empowerment has a strong impact on Innovation Behaviors (see Table 4.21). The paradigm is being used to examine Psychological Empowerment of surgeons in hospital in China.

H4: Psychological Empowerment mediates the relationship between Leadership Development and Surgeon Innovation Behaviors in hospitals in China (see Table 4.22). **(Accepted Hypothesis)**.

The hypothesis explains that Psychological Empowerment mediates the relationship between Leadership Development and Innovation Behaviors of surgeons in hospitals in China. This implies that leadership development may indirectly affect innovation behaviors by influencing psychological empowerment.

Therefore, the acceptance of these hypotheses suggests that by promoting the leadership development and psychological empowerment of surgeons, hospital managers

can significantly stimulate the innovation behavior of surgeons, thus promoting the quality improvement of medical services and technological innovation.

Table 4.23

Hypothesis Testing

NO.	Hypothesis	Result
H1	Leadership Development has a direct effect on Surgeon Innovation Behaviors in hospitals in China.	Accepted
H2	Leadership Development has a direct effect on Psychological Empowerment of surgeons in hospitals in China.	Accepted
H3	Psychological Empowerment has a direct effect on Surgeon Innovation Behaviors in hospitals in China.	Accepted
H4	Psychological Empowerment mediates the relationship between Leadership Development and Surgeon Innovation Behaviors in hospitals in China.	Accepted

4.6 In-depth Interview Data Analysis

This research used in-depth interviews for qualitative research. The researcher interviewed eight surgeons in hospitals, two hospital directors, and two government officers in China. The data from the in-depth interview confirmed the results of the questionnaire survey.

4.6.1 In-depth Interview Data Analysis on Leadership Development

All interviewees agreed that strategic thinking is related to leadership development and positively affects psychological empowerment and innovation behavior. Interviewee No.1 said, “In healthcare, especially in complex surgeries and team management,

anticipating trends and big-picture perspectives help us make better decisions. By developing strategic thinking, we can better plan the future direction of our learning and development, which is very helpful in enhancing leadership." This is similar to the opinion of interviewee No.3, who said, "Strategic thinking has helped him or her to understand surgical practice trends from a more macro perspective, not only to meet immediate challenges, but also to lead the team in dealing with future changes. Strategic thinking can help us surgeons lead our teams technically and play an active role in innovation and healthcare reform." Interviewee No.9 says, "With hospitals facing a rapidly changing healthcare environment, surgeons can anticipate future trends through strategic thinking and make decisions and plans accordingly. For example, as new technologies emerge, surgeons need to anticipate how they will impact surgical and treatment modalities, leading their teams in innovation."

All interviewees agreed that communication is related to leadership development and positively affects psychological empowerment and innovation behavior. Interviewee No.2 said, "In teamwork, communicating clearly and effectively prevents misunderstandings and ensures that surgeries and treatments go smoothly. Additionally building effective relationships with patients and their families and gaining their trust is essential for us surgeons to implement innovation behaviors". Interviewee No.6 echoed similar sentiments saying, "By communicating effectively, we surgeons can motivate our team members, promote interdisciplinary collaboration, and enhance our understanding of the significance of our work, which is is very important for driving innovation and progress in medical research." According to interviewee No.11, "As the healthcare environment and policies change, surgeons must communicate and collaborate extensively with the government, other healthcare organizations, and the community. Surgeons with strong communication skills are likelier to take a leadership role in these multiple interactions, driving innovation and quality improvement in health care."

All interviewees agreed that motivation is related to leadership development and positively affects psychological empowerment and innovation behavior. Interviewee No.4 said, "I think as surgeons, we need to have strong professional skills and the ability to

manage and lead a team. By motivating our team members, we can increase their motivation, which in turn improves the working atmosphere and ensures efficient operation of the operating room and department." Interviewee No.7 also agreed that "surgeons tend to maintain a high degree of focus and responsibility when facing patients. Team support and collaboration are indispensable." Through compelling motivation, we can not only help team members release pressure, but also stimulate their creativity and work enthusiasm, thus improving the whole team's efficiency." Interviewee No.10 shared this view, believing surgeons can inspire teams to innovate and break new ground in their clinical work. Especially when external rewards are linked to career advancement, doctors can inspire team members to work with enthusiasm and innovation.

All interviewees agreed that training is related to leadership development and positively affects psychological empowerment and innovation behavior. Interviewee No.3 said, "We need to not only master medical technology, but also learn how to lead teams effectively, manage stress, and make decisions." Training helps us maintain our resilience, enhance our sense of meaning and value in our work, and enhance our innovation ability." Interviewee No. 5 shared this view: "Training helps surgeons understand how to influence others and take a leadership role in a team." "Through training, surgeons can improve their team management, communication, coordination, and decision-making skills, which have a direct impact on the quality of care and patient safety," the Interviewee No.12 stressed.

The summary of the results is listed in Table 4.24

Table 4.24

Results of the Leadership Development Interview

Varliable		Conclusion	Opinions
Leadership Development	Strategic Thinking	Strategic thinking is related to leadership development and positively affects psychological empowerment and innovation behaviors.	Interviewee No.3 mentioned "Strategic thinking helps to understand surgical practice trends from a macro perspective and improve self-efficacy," while interviewee No.1 said, "In healthcare, especially in complex surgeries and team management, anticipating trends and big-picture perspectives help us make better decisions. By developing strategic thinking, we can better plan the future direction of our learning and development, which is very helpful in enhancing leadership.
	Communication	Communication is related to leadership development and positively affects psychological empowerment and innovation behaviors.	Interviewee No.6 pointed out "By communicating effectively, we can motivate our team members and promote interdisciplinary collaboration." while interviewee No.11 agreed that "As healthcare environments and policies evolve, surgeons must engage in extensive communication with government bodies, healthcare organizations, and the community. Those with strong communication skills are more likely to assume leadership roles, promoting

Varliable		Conclusion	Opinions
			innovation and quality improvement in healthcare.”
Leadership Development	Motivation	Motivation is related to leadership development and positively affects psychological empowerment and innovation behaviors.	Interviewee No.10 pointed out “When external rewards are linked to career advancement, surgeons can inspire team members to work with enthusiasm and innovation.” while Interviewee No.7 said "Surgeons tend to maintain a high degree of focus and responsibility when facing patients. Team support and collaboration are indispensable. Through compelling motivation, we cannot only help team members release pressure, but also stimulate their creativity and work enthusiasm, thus improving the whole team's efficiency."

Varliable		Conclusion	Opinions
	Training	Training is related to leadership development and positively affects psychological empowerment and innovation behaviors.	Interviewee No.12 stated,"Training helps us understand how to influence others and take a leadership role in a team." while interviewee No.3 said, "We need to not only master medical technology, but also learn how to lead teams effectively, manage stress, and make decisions." Training helps us maintain our resilience, enhance our sense of meaning and value in our work, and enhance our innovation ability."

In conclusion, the interview results confirmed that strategic thinking, communication, motivation, and training are related to leadership development and support the results for hypotheses 1 and 2.

4.6.2 In-depth Interview Data Analysis on Psychological Empowerment

All interviewees in the study concurred that the concept of meaning is intrinsically linked to psychological empowerment and exerts a beneficial influence on innovative behavior. Interviewee No.2 articulated, “This intrinsic sense of meaning propels me to investigate novel treatments and methodologies, thereby enhancing my capacity for innovation, particularly when I realize that my professional responsibilities extend beyond merely executing surgical procedures; they encompass the imperative to enhance the quality of life of my patients.” This was echoed by interviewee No.3, who said, “Each of us is driven by this sense of meaning in our innovation behaviors, especially when faced with complex surgical and therapeutic challenges.” Interviewee No.10, who said, “We do everything we can to make physicians realize that their work is not just about completing

surgeries and treatments, but also about the quality of patients' lives and the hospital's standard of care."

All interviewees in the interview collectively recognized that self-determination is intricately linked to psychological empowerment and exerts a beneficial influence on innovative behavior. Interviewee No.1 expressed, "When we are afforded greater autonomy, we are incentivized to make decisions grounded in our professional judgment and expertise, which significantly augments my motivation and creative cognitive processes." Interviewee No.4 further stated, "For surgeons, the capacity to exercise autonomous decision-making, particularly regarding certain clinical treatment alternatives, enhances their confidence and motivation to pursue innovation." Interviewee No.10 also corroborated this perspective: "We have instituted various autonomous decision-making frameworks within our hospital and have observed that when surgeons are permitted to make reasonable autonomous decisions, they demonstrate a greater willingness to experiment with novel techniques and surgical methodologies."

All interviewees in the interviews concurred that self-efficacy is intricately linked to psychological empowerment and exerts a positive influence on innovative behavior. Interviewee No.3 articulated, "When I perceive that I possess the capability to navigate the diverse complexities inherent in surgery, this confidence propels me to investigate novel treatments and surgical methodologies." This perspective was corroborated by interviewee No.6, who asserted, "I am convinced that the enhancement of leadership directly bolstered my sense of self-efficacy, which subsequently stimulated my innovative behavior." Conversely, interviewee No.9 affirmed this notion from a managerial standpoint, stating, "In my managerial experience, I have observed that by augmenting surgeons' leadership capabilities, not only is their self-confidence enhanced, but their decision-making proficiency in the face of adversity is also improved. When surgeons exhibit a robust sense of self-efficacy, they demonstrate a greater propensity to engage in the exploration of innovative treatment alternatives and techniques."

All interviewees in the interviews concurred that the concept of impact is intrinsically linked to psychological empowerment, thereby exerting a favorable influence

on innovative behaviors. Interviewee No.8 articulated, “When I exert influence across various disciplines, I can facilitate the exchange of novel ideas among departments and foster innovative interdisciplinary collaborations. My influence encourages the team to explore new treatment modalities and methodologies.” Interviewee No.4 articulated, “Augmenting the influence of surgeons amplifies their individual decision-making authority while simultaneously fostering teamwork and innovation.” In accordance with the remarks of interviewee No.12, “Our focus also extends to the provision of leadership training opportunities for surgeons within our daily management framework, thereby enhancing their influence through the establishment of a communication platform, and encouraging them to proactively refine their medical methodologies and techniques, which ultimately elevates the quality and efficiency of healthcare.”

The summary of the results is listed in Table 4.25

Table 4.25

Results of the Psychological Empowerment Interview

Varliable		Conclusion	Opinions
Psychological Empowerment	Meaning	This is related to psychological empowerment and positively affects innovation behavior.	Interviewee No.2 emphasized, "The job of meaning can drive surgeons to explore new treatments and techniques." while interviewee No.10 said, "We do everything we can to make physicians realize that their work is not just about completing surgeries and treatments, but also about the quality of patients' lives and the hospital's standard of care."
	Self-determination	Self-determination is related to psychological empowerment and positively affects innovation behavior.	Interviewee No.4 stated,"For surgeons, self-determination on some of the clinical treatment options makes them more confident and motivated to try to innovate." while interviewee No.10 said, "We have instituted various autonomous decision-making frameworks within our hospital and have observed that when surgeons are permitted to make reasonable autonomous decisions, they demonstrate a greater willingness to experiment with novel techniques and surgical methodologies."

Varliable		Conclusion	Opinions
Psychological Empowerment	Self-efficacy	Self-efficacy is related to psychological empowerment, and it positively affects innovation behavior.	Interviewee No.3 pointed out "When I feel that I can cope with the various complexities in surgery, this confidence motivates me to explore new treatments and surgical techniques." while interviewee No.6, who asserted, "I am convinced that the enhancement of leadership directly bolstered my sense of self-efficacy, which subsequently stimulated my innovative behavior."
	Impact	Impact is related to psychological empowerment, and it positively affects innovation behavior.	Interviewee No.8 pointed out " The surgeon's influence dares the surgery team to try new treatment options and approaches." while interviewee No.12 said, "Our focus also extends to the provision of leadership training opportunities for surgeons within our daily management framework, thereby enhancing their influence through the establishment of a communication platform, and encouraging them to proactively refine their medical methodologies and techniques, which ultimately elevates the quality and efficiency of healthcare."

In conclusion, the interview result confirmed that meaning, self-determination, self-efficacy, and impact are related to psychological empowerment and support the result for hypothesis 3.

4.6.3 In-depth Interview Data Analysis on Innovation Behaviors

All interviewees in the interviews concurred that the process of idea generation is intrinsically linked to innovation behavior. Interviewee No.7 articulated, “I posit that the formulation of novel ideas constitutes the initial phase of an innovative process; however, of greater significance is the capacity for these concepts to undergo experimental and clinical validation, ultimately enhancing therapeutic interventions.” Interviewee No.5 expressed a similar sentiment: “The inception of innovative concepts may serve as an indicator of the innovative behavior exhibited by surgeons, yet the paramount consideration lies in the feasibility of applying these concepts within the surgical team.” Interviewee No.11 echoed this perspective: "Innovative concepts serve as a critical indicator of surgeons' innovation behavior, albeit representing merely the initial stage. Nevertheless, innovation behavior transcends the mere generation of new ideas; the focal point is the practical application of those ideas within clinical settings.”

All interviewees concurred that the process of idea realization is intrinsically linked to innovation behavior. Interviewee No.1 articulated, “I posit that the actualization of innovation concepts is a strong indicator of the innovation behavior exhibited by surgeons. Following numerous trials and refinements, I have introduced a novel surgical approach that was ultimately implemented successfully in patients, yielding outstanding outcomes.” Interviewee No.2 expressed strong alignment with this perspective: "In our discipline, concepts that fail to be effectively converted into surgical methodologies or treatments cannot be regarded as genuine innovation behavior. Innovation transcends mere theoretical output; it fundamentally entails the generation of tangible results through practical application, particularly in enhancing patient health.” Interviewee No. 9 reaffirmed this notion: "The successful implementation of an innovative idea that yields positive results in

clinical practice not only signifies the surgeon's capacity for innovation but also reflects the institution's endorsement and facilitation of innovation endeavors.”

The summary of the results is listed in Table 4.26

Table 4.26

Results of the Innovation Behaviors Interview

Variable		Conclusion	Opinions
Innovation Behaviors	Idea generation	The idea generation is related to the innovation behavior.	Interviewee No.11 said that “Innovative ideas are a key reflection of surgeons' innovation behavior” while interviewee No.7 said, “I posit that the formulation of novel ideas constitutes the initial phase of an innovative process; however, of greater significance is the capacity for these concepts to undergo experimental and clinical validation, ultimately enhancing therapeutic interventions.”

	Idea realization	Idea realization is related to the innovation behavior.	Interviewee No. 9 pointed out that “The successful implementation of innovative ideas in clinical practice demonstrates the innovative ability of surgeons while interviewee No.1 said, “I posit that the actualization of innovation concepts is a strong indicator of the innovation behavior exhibited by surgeons. Following numerous trials and refinements, I have introduced a novel surgical approach that was ultimately implemented successfully in patients, yielding outstanding outcomes.”

In conclusion, the interview result confirmed that idea generation, and idea realization are related to innovation behavior.

4.6.4 In-depth Interview Data Analysis on Mediating Effect

All interviewees agreed that psychological empowerment mediates between leadership development and innovation behaviors in hospitals in China. Interviewee No. 6 said, “A surgeon who is a strong leader not only helps team members improve their professional skills, but also increases everyone's sense of engagement and responsibility through empowerment. Psychological empowerment means that we feel valued for our role in the team, and this sense of trust enables us to be more active in coming up with innovative ideas and participating in trying out new treatments or techniques.” Interviewee No.3 stated, “In my opinion, leadership development indirectly influences surgeons' innovation behavior by increasing their confidence, decision-making power, and influence. Psychological empowerment helps physicians better realize these potentials. Through empowerment, physicians can implement innovations and explore new treatment modalities or techniques without excessive constraints.” Interviewee No.9 also said,

“Leadership development is more than just skills and management competencies; it involves empowering physicians with more autonomy and decision-making power. Psychological empowerment is the embodiment of this empowerment. When surgeons feel trusted and empowered to make decisions, they are more willing to try new treatments and techniques, fostering innovation. Only when they feel psychologically empowered can surgeons fundamentally inspire their innovation behavior and drive hospitals forward.” Interviewee No.12 echoed this sentiment: "Surgeons' innovation behaviors depend not only on leadership development itself, but also on their ability to gain sufficient trust and autonomy in their work. Psychological empowerment enhances physicians' self-confidence and sense of responsibility and motivates them to try new ideas and approaches. Physicians may be overly constrained without psychological empowerment, resulting in limited innovation behavior.”

The summary of the results is listed in Table 4.27.

Table 4.27

Topic	Conclusion	Opinions
The mediating effect of psychological empowerment between leadership development and innovation behaviors	Psychological empowerment has a mediating effect between leadership development and innovation behaviors in hospitals in China.	Interviewee No. 6 pointed out that " A surgeon who is a strong leader helps team members improve their professional skills and increases everyone's sense of engagement and responsibility through empowerment. Interviewee No.3 said that "Leadership development indirectly influences surgeons' innovation behavior by increasing their confidence, decision-making power, and influence. Interviewee No.9 pointed out that "Leadership development is more than just skills and management competencies; it involves empowering physicians with more autonomy and decision-making power. Feeling psychologically empowered can inspire surgeons to innovate."

Results of the Mediating Effect of Psychological Empowerment Interview

In conclusion, the interview results show psychological empowerment is the mediator between leadership development and innovation behaviors and confirm the result for hypothesis 4.

4.7 Combination of Quantitative Data Analysis and Qualitative Data Analysis

Based on the questionnaire data and in-depth interview results, hypotheses 1, 2, 3, and 4 are all supported. The details of each hypothesis testing result are as follows:

The route coefficient of leadership development on innovation behavior is 0.238. The regression weight estimates of 0.238 have a S.E. of around 0.063. Dividing the regression weight estimate by the standard error estimate yields z=0.238/0.063= 3.788. The standardized regression weight estimate is 0.243. All these data indicate that leadership

development has a significant positive impact on innovation behavior. This is inline with interviewee No. 3 who said, “Surgeons with strong leadership are better at driving clinical research, encouraging team members to come up with innovative ideas, and helping the team implement those ideas,” and interviewee No. 12 who said, “With stronger leadership, surgeons can not only improve their position in the team, but also drive team members to come up with innovative solutions.” These correspond with Hypothesis 1: Leadership Development directly affects surgeon innovation behavior in hospitals in China.

The route coefficient of leadership development on psychological empowerment is 0.489. The regression weight estimates of 0.489 have a S.E. of around 0.066. Dividing the regression weight estimate by the standard error estimate yields z=0.489/0.066 = 7.409. The standardized regression weight estimate is 0.454. All these data indicate that leadership development has a significant and strong positive effect on psychological empowerment. This is inline with interviewee No. 7 who said, “A surgeon with a high level of leadership can effectively coordinate the team members, giving us full trust and autonomy in decision-making,” and interviewee No. 8 who said, “If surgeons have strong leadership, they can improve the psychological empowerment of team members by giving the team more decision-making power and responsibility.” These are corresponding with Hypothesis 2: Leadership Development has a direct effect on psychological empowerment of surgeons in hospitals in China.

The route coefficient of psychological empowerment on innovation behavior is 0.515. The regression weight estimates of 0.515 have a S.E. of around 0.070. Dividing the regression weight estimate by the standard error estimate yields z=0.515/0.070 = 7.357. The standardized regression weight estimate is 0.565. All these data indicate that psychological empowerment has a significant and strong positive effect on innovation behavior. This is inline with interviewee No.1 who said, “Psychological empowerment not only increased my sense of control over my work, it also gave me confidence to innovate,” and interviewee No.9 who said, “Giving surgeons more autonomy and decision-making power will not only increase their motivation to work, but also inspire them to come up

with new and innovative ideas." These are corresponding with Hypothesis 3: Psychological Empowerment has a direct effect on surgeon innovation behavior in hospitals in China.

The direct impact of leadership development on innovation behavior was quantified at 0.24, with a 95% confidence interval that does not encompass 0, thereby signifying the statistical significance of the direct effect. The indirect effect of leadership development, psychological empowerment, and innovation behavior (LD→PE→IB) was calculated at 0.25, with the 95% confidence interval excluding 0, which indicates the significance of the indirect effect at 51%.All these data suggest that psychological empowerment has a significant partial mediating effect on leadership development and surgeons' innovation behavior. It is inline with interviewee No. 1 who said, "As a surgeon, when I feel empowered with more decision-making power and autonomy, I am more motivated to come up with new treatment options or explore better surgical approaches," and interviewee No. 10 who said, "Leadership development leads to more responsibility and authority, and surgeons are often able to innovate more boldly when they feel they have the freedom and space to make decisions in clinical practice." These results supported Hypothesis 4: Psychological Empowerment mediates the relationship between Leadership Development and Surgeon Innovation Behavior in hospitals in China.

CHAPTER 5
RESEARCH CONCLUSION, DISCUSSION, AND RECOMMENDATION

This chapter presents the conclusions drawn from the study's findings, provides a detailed discussion of the implications, and offers recommendations based on the research outcomes.

5.1 Research Conclusion

5.1.1 Conclusion for the Quantitative Research

5.1.2 Conclusion for the Qualitative Research

5.2 Discussion

5.3 Recommendation

5.1 Research Conclusion

5.1.1 Conclusion for the Quantitative Research

Five hundred and twenty-three questionnaires were distributed, and 461 were returned, with a return rate of 88%. Nine invalid questionnaires were excluded, leaving 452 valid questionnaires.

5.1.1.1 Personal Information of Informants

Demographic data indicates that the majority of respondents consisted of 366 males, representing 80.97%; the predominant age cohort was predominantly situated within the range of 35 to 44 years, constituting 37.39%; 83.41% of the respondents were married; the highest number of individuals possessing a bachelor's degree was 281, which corresponds to 62.17%; the maximum count of public hospitals was 383, amounting to 84.73%; 205 respondents are affiliated with Tertiary hospitals, which constitutes 45.35%; the number of attending physicians was 208, accounting for 46.02%; 247 physicians

receive a monthly salary exceeding 10,001 CNY, representing 54.65%; the maximum number of individuals with over 10 years of professional experience was 267, equating to 59.07%; Guangdong Province and Jiangsu Province displayed the highest respondent numbers, with 12.83% and 12.71% respectively, together accounting for 25.14% of the total respondents.

5.1.1.2 Conclusion of Leadership Development (LD)

This section outlines the respondents' perception of leadership development. Training got the highest average mean at the agree level ($\bar{X}$= 3.88, S.D. = 1.34), followed by motivation, strategic thinking, and communication.

For attitude towards strategic thinking, the average level of opinion was Agree ($\bar{X}$= 3.84, S.D. = 1.26). The highest opinion was "I develop clear surgical strategies and follow-up plans when faced with complex surgical decisions." The lowest was "I can summarize lessons learned during surgical procedures into new clinical pathways or guidelines."

For attitude towards communication, the average level of opinion is Agree ($\bar{X}$= 3.84, S.D. = 1.28). The highest opinion was "I can clearly explain complex surgical procedures and the rationale for decisions to team members," the lowest was "I can use appropriate communication styles to improve team collaboration and efficiency in the department."

For attitude towards motivation, the average level of opinion was Agree ($\bar{X}$= 3.87, S.D. = 1.28). The highest opinion was that "I maintain team motivation and energy by creating challenging and meaningful work assignments.". The lowest was "I can motivate team members through clear division of labor and goal setting," and "I recognize team members' needs and provide targeted feedback and coaching."

For attitude towards training, the average level of opinion was Agree ($\bar{X}$= 3.88, S.D. = 1.34). The highest opinion was "I encourage my team members to participate in various business skills training." The lowest was "Regular training and updating of skills are important to maintain a high level of surgical practice," and "I actively participate in simulated surgery and reflective learning to continually improve clinical and leadership skills."

5.1.1.3 Conclusion of Psychological Empowerment (PE)

This section outlined the respondents' perception of psychological empowerment. Among four categories, meaning and self-determination got the highest average mean at the level of agree ($\bar{X}$= 3.84, S.D.(meaning) = 1.45, S.D.(self-determination) = 1.31), followed by self-efficacy and impact.

For attitude towards meaning, the average level of opinion was Agree ($\bar{X}$= 3.84, S.D. = 1.45). The highest opinion was "My work is consistent with my personal goals and values," and the lowest is "My work is vital to me."

For attitude towards self-determination, the average level of opinion is Agree ($\bar{X}$= 3.84, S.D. = 1.31). The highest opinion was that "I have a great deal of independence and autonomy in my job." The lowest was "I can decide how to proceed with my work," and "I have the right to choose the techniques and methods used in my work."

For attitude towards self-efficacy, the average level of opinion was Agree ($\bar{X}$= 3.82, S.D. = 1.37). The highest opinion was that "I am very confident in my ability to do my job." Moreover, the lowest was "I am confident in my ability to do the things I do on the job."

For attitude towards impact, the average level of opinion was Agree ($\bar{X}$= 3.79, S.D. = 1.36). The highest opinion was "I significantly influence what happens in my department." The lowest was "I have much influence over what happens in my department."

5.1.1.4 Conclusion of Innovation Behaviors (IB)

This section outlined the respondents' perception of psychological empowerment. Among the two categories, idea realization got the highest average mean at the level of agree ($\bar{X}$= 3.87, S.D. = 1.38), followed by idea generation.

For attitude towards idea generation, the average level of opinion was Agree ($\bar{X}$= 3.85, S.D. = 1.38). The highest opinion was "I will look at problems from different perspectives to gain deeper insights." The lowest was "I will develop ideas or solutions to problems."

For attitude towards idea realization, the average level of opinion was Agree ($\bar{X}$= 3.87, S.D. = 1.38). The highest opinion was “I will try to convince others of the importance of a new technology or treatment.” The lowest was “When applying a new technique to a patient's surgery, I will try to fix the problems created by the new method.”

5.1.1.5 Reliability, Validity, and Structural Equation Model on Relationship Results

The research employed reliability analysis, validity evaluation, and structural equation modeling (SEM) methodologies to examine the dataset. A total of four hundred fifty-two questionnaires were gathered, processed, and subjected to analysis utilizing structural equation modeling techniques.

In accordance with the outcomes of the confirmatory factor analysis, the Cronbach's Alpha coefficients for the four constructs of leadership development identified in the equation were 0.894, 0.916, 0.911, and 0.925, all exceeding the threshold of 0.7. The average variance extracted (AVE) metrics were recorded as 0.628, 0.688, 0.637, and 0.712, with each score surpassing the minimum requirement of 0.5. The construct reliability (CR) values were determined to be 0.894, 0.917, 0.911, and 0.925, all exceeding the benchmark of 0.8.

The Cronbach's Alpha coefficients pertaining to the four constructs of psychological empowerment indicated values of 0.944, 0.912, 0.933, and 0.925, each also exceeding the threshold of 0.7. The average variance extracted (AVE) scores were identified as 0.771, 0.677, 0.734, and 0.711, all surpassing the requisite level of 0.5. The construct reliability (CR) scores were noted as 0.944, 0.912, 0.932, and 0.925, all greater than the established standard of 0.8.

The Cronbach's Alpha coefficients for the two constructs of innovation behavior in the analysis were recorded at 0.935 and 0.940, each exceeding the minimum threshold of 0.7. The average variance extracted (AVE) values were 0.744 and 0.759, both surpassing the required criterion of 0.5. The construct reliability (CR) coefficients were found to be 0.936 and 0.940, each exceeding the critical value 0.8.

According to the structural equation modeling (SEM) analysis conducted via AMOS, the path coefficient indicative of the impact of leadership development on psychological empowerment was determined to be 0.489, accompanied by a standard error (S.E.) of 0.066. The standardized regression weight for this association was calculated at 0.454. Additionally, the path coefficient pertaining to the effect of psychological empowerment on innovation behavior was found to be 0.515, with a standard error of 0.070. Moreover, the direct influence of leadership development on innovation behavior yielded a path coefficient of 0.238, a standard error of 0.063, and a standardized regression weight of 0.243. The analysis further indicated a statistically significant indirect effect of psychological empowerment in mediating the relationship between leadership development and innovation behavior, with an estimated value of 0.257. The 95% confidence interval for this indirect effect did not encompass zero, thereby affirming its statistical significance. This mediation effect constituted 51% of the total effect, thereby emphasizing its critical role within the model.

5.1.2 Conclusion for the Qualitative Research

Regarding leadership development, all participants unanimously identified strategic thinking, communication, motivation, and training as key components closely associated with leadership development. Similarly, for psychological empowerment, all interviewees consistently acknowledged meaning, self-determination, self-efficacy, and impact as integral dimensions of this construct. Furthermore, in the context of innovation behavior, all respondents agreed that idea generation and idea realization were directly linked to this variable. In summary, the results indicate that all subordinate variables analyzed in the research exhibit a substantial correlation with their corresponding principal variables as delineated in the proposed framework.

5.2 Discussion

This research endeavor posited four hypotheses pertaining to the identified research problem, all of which were substantiated by the findings derived from both quantitative and qualitative analyses. In essence, the examination of survey data collected from Chinese surgeons revealed significant correlations among leadership development, psychological empowerment, and innovation behaviors, with psychological empowerment serving as a mediating variable between leadership development and innovation behavior.

5.2.1 The Significance Effect of Leadership Development on Psychological Empowerment

The AMOS structural equation modeling results indicate that leadership development positively affects psychological empowerment, with a path coefficient of 0.489. It signifies a favorable correlation, suggesting that an augmentation in leadership development is concomitant with an enhancement in psychological empowerment. The regression weight estimates of 0.489 have a S.E. of around 0.066. Leadership development's regression weight predicts psychological empowerment strongly ($p<0.001$) (two-tailed). The standardized regression weight estimate is 0.454. This outcome aligns with the conclusions drawn from prior research. Abbas and Khal (2016) found that strategic thinking skills influence psychological empowerment by increasing the sense of mission among healthcare workers. Some scholars found through empirical research a positive relationship between communication, motivation and training and psychological empowerment (Reza, 2016; Hezaveh et al., 2020 ; Saira et al.,2021 ; Wang et al., 2022; Schermuly et al., 2022). These findings indicate that fundamental components of leadership development (such as strategic thinking, communication, motivation, and training) may significantly augment surgeons' self-perception regarding their competencies and the worth of their contributions, ultimately resulting in increased autonomy, influence, and accountability within their professional practice.

This is in line with the results of the in-depth interview. For example, interviewee No. 9 said, “Leadership development is not only about improving the management ability of surgeons, but more importantly, enhancing their sense of psychological empowerment

by giving them more autonomy and decision-making power. When surgeons learn how to better lead teams, make decisions, and communicate, they tend to gain more autonomy and responsibility in their actual work." and interviewee No.7, who said that "A surgeon with high leadership can effectively coordinate the team members, giving us full trust and autonomy in decision-making. This psychological empowerment not only makes us feel a sense of meaning and responsibility in our work, but also motivates us to explore new surgery methods and enhance the team's overall innovation ability."

Therefore, the study showed that leadership development has a direct positive impact on psychological empowerment.

5.2.2 The Significance Effect of Psychological Empowerment on Innovation Behaviors

The AMOS structural equation modeling results indicate that psychological empowerment significantly positively affects innovation behavior, with a path coefficient 0.515. It denotes a favorable correlation, indicating that as psychological empowerment escalates, the propensity for innovation behavior similarly tends to rise. The regression weight estimates of 0.515 have a S.E. of around 0.070. Psychological empowerment's regression weight estimate is 7.384 (C.R.), predicting innovation behavior strongly ($p<0.001$) (two-tailed). The standardized regression weight estimate is 0.565. The result is consistent with Zhang et al. (2022) and James et al. (2023), who found that psychological empowerment directly influences innovation behavior. Because psychological empowerment is generally regarded as the intrinsic motivation of employees, employees with psychological empowerment experience believe that they have autonomy and influence over their work, and will feel less restricted by technology and rules than other employees, so that they may be more active, proactive, and creative (Amabile, 1988).

This is in line with the results of the in-depth interview. For example, interviewee No. 1 stated, "Psychological empowerment gives us more autonomy and responsibility, and this sense of empowerment not only reduces our reliance on traditional experiences and procedures, but also encourages us to try new methods and protocols when facing complex cases and treatment decisions." Interviewee No. 10 also had a similar view: "I

think psychological empowerment has a direct effect on the innovation behavior of surgeons. When surgeons have more autonomy in their work, they can be more flexible in responding to change, especially in adopting new technologies and treatments."

Therefore, the study showed that psychological empowerment has a direct positive impact on innovation behavior.

5.2.3 The Significance Effect of Leadership Development on Innovation Behaviors

The AMOS structural equation modeling results indicate that leadership development positively affects innovation behavior, with a path coefficient of 0.238. It denotes a favorable correlation, signifying that an escalation in leadership development is concomitant with an augmentation in innovation behaviors. The regression weight estimates of 0.238 have a S.E. of around 0.063. Leadership development's regression weight estimate is 3.769 (C.R.), predicting innovation behavior strongly ($p<0.001$) (two-tailed). The standardized regression weight estimate is 0.243. The outcome aligns with the conclusions drawn by Goldman and Scott (2016) and Gross (2017), who established that strategic thinking plays a crucial role in influencing the innovative behaviors of both leaders and employees, thereby augmenting their capacity to recognize and exploit opportunities for innovation. Communication and motivation can stimulate innovation behavior (Amabile & Pratt, 2016; Sangperm & Chienwattanasook, 2019; Nurhidayati & Sabrina, 2023 ; Li et al.,2024). This is also consistent with the leader-member exchange theory. The leader-member exchange theory emphasizes that the interaction quality and trust level between leaders and different employees are different, and this differentiated relationship will affect employees' work performance, satisfaction, and development potential (Cortes & Herrmann, 2021).

This is in line with the results of the in-depth interview. For example, interviewee No. 2 said, "When surgeons have strong leadership, they are better able to drive the implementation of new technologies and new methods. Leadership can not only enhance self-confidence, but also improve collaboration efficiency with the team." Interviewee No.

11 said, "Surgeons are more than just technologists; their leadership is also key to driving innovation in the healthcare industry. Surgeons with higher levels of leadership can better organize and promote interdisciplinary collaboration to create new treatment approaches and management models."

Therefore, the study showed that leadership development has a direct positive impact on innovation behaviors.

5.2.4 The Mediating Effect of Psychological Empowerment on the Relationship between Leadership Development and Innovation Behaviors

The total effect of leadership development on innovation behavior was 0.499, with a 95% confidence interval not containing 0. When psychological empowerment is considered as a mediating variable, leadership development has a significant comprehensive effect on innovation behavior. Leadership development, psychological empowerment, and innovation behavior (LD→PE→IB) indirect effect is 0.252, and the 95% confidence interval does not include 0, indicating an indirect effect significance, in 51%. This indicated leadership development indirectly drives surgeons' innovation behavior by enhancing their sense of psychological empowerment, such as increased autonomy, competence, and influence. The indirect effect exhibits a marginally greater significance when compared to the direct effect, indicating that psychological empowerment occupies a relatively crucial position within this process. Simultaneously, the effect of leadership development on innovation behavior is significant. This indicates that leadership development indirectly drives surgeons' innovation behavior by enhancing their psychological empowerment—such as autonomy, competence, and influence—a mechanism that closely aligns with the finding some scholars that leadership influences employee creativity through psychological empowerment (Dedahanov et al., 2019;Zhu et al., 2019). In other words, leadership development can indirectly encourage surgeons to innovate more by increasing their sense of psychological empowerment.

This is consistent with the results of the in-depth interview. For example, interviewee No. 11 said, "From a government management perspective, I think psychological empowerment does mediate between leadership development and the

surgeon's innovation behavior. At the hospital level, leadership development helps enhance surgeons' management ability and influence, while psychological empowerment provides them with more initiative and autonomy. This psychological empowerment allows surgeons to experiment with new approaches and protocols and drive medical innovation without too much intervention." This suggests that psychological empowerment plays an important role in the influence of leadership development on innovation behavior and encourages surgeons to participate more actively in innovative activities. This empirical observation aligns with the postulations of self-determination theory, which posits that an enhancement in employees' perceptions of autonomy and control is positively correlated with an increased propensity to engage in innovation behaviors (Deci & Ryan, 1985).

The study showed that psychological empowerment mediates the relationship between leadership development and innovation behaviors of surgeons in hospitals in China.

5.2.5 Discussion of the New Findings

5.2.5.1 The Dimension of Leadership Development

Although pertinent theoretical frameworks concerning leadership development have been articulated in the extant literature, a limited number of empirical investigations have examined the impact of each dimension of leadership development on individuals' innovative behaviors (Day et al., 2021). The empirical analysis of this study reveals, for the first time, the specific mechanism of leadership development in surgeons' innovation behavior, especially the key role of strategic thinking, training, motivation, and communication in promoting surgeons' innovation behavior. Through quantitative data analysis, this study identifies four core dimensions through which leadership development has a significant impact on the innovation behavior of surgeons. Leadership development significantly enhanced the strategic thinking ability of surgeons, helping them to analyze and make decisions from a global perspective; Through targeted training, leadership development significantly improves the professional skills and comprehensive abilities of surgeons, enabling them to cope with more complex medical challenges, and effectively

stimulates the intrinsic motivation of surgeons through incentive mechanisms, thus promoting the generation of their innovation behaviors. It also improves surgeons' communication skills, promoting teamwork and the exchange of innovative ideas. These are supported by change leadership theory and leadership Practice checklist theory. The transformational leadership theory posits that leaders foster self-transcendence and innovation behavior among their employees by enhancing their intrinsic motivation, offering individualized support, and providing intellectual engagement (Bass, 1990). The inventory theory of leadership practices emphasizes that leaders promote the growth and innovation of employees through five practices, such as inspiring a shared vision, challenging the status quo, and empowering others (Kouzes & Posner, 2007). This finding provides empirical support for deepening leadership development theory and the concrete path between leadership development and innovation behavior.

5.2.5.2 The Mediating Role of Psychological Empowerment

Although the mediating function of psychological empowerment has been substantiated by numerous scholarly works, this research represents one of the limited empirical investigations that have substantiated the mediating function of psychological empowerment in the nexus between leadership development and innovation behavior, revealing that its indirect impact (0.25) is remarkably proximate to its direct effect (0.24), thereby underscoring the significance of psychological empowerment within this dynamic. The results suggest that leadership development not only directly affects the innovation behavior of surgeons but also indirectly promotes innovation behavior by enhancing psychological empowerment. This finding sheds new light on leadership development theory, especially in the medical field, revealing the important role of psychological empowerment as an intermediary mechanism. The findings presented indicate that various facets of leadership development, including strategic thinking, communication, motivation, and training, significantly foster innovative behavior by enhancing surgeons' autonomy, self-efficacy, and professional influence. This indicates that the effect of leadership development should not only be regarded as a direct influence, but should also pay attention

to its indirect promotion of innovation behavior through psychological empowerment. Currently, there exists a limited number of empirical investigations examining the impact of leadership development on employees' innovation behaviors, particularly those that emphasize psychological mechanisms such as psychological empowerment. This study further explains the internal relationship between leadership development and innovation behavior through psychological empowerment as an intermediary variable, which provides theoretical support and new research direction for subsequent research on leadership development.

5.2.5.3 The Impact of Technological Advancements on the Surgeon Innovation Behaviors

Innovation behavior constitutes a multifaceted, multi-factorial process that is shaped by an array of internal and external determinants. While the advancement of leadership capabilities significantly contributes to innovation behavior, it is imperative to recognize that innovation behavior is not solely contingent upon leadership; rather, it is intricately linked to a multitude of factors, including the external environment, organizational culture, individual characteristics, and the availability of resources. Therefore, an impact value of 0.49 may reflect an important but not the only role of leadership development among these factors. In interviews, more surgeons mentioned advances in surgical techniques or medical instruments used in surgery as a very important factor affecting their innovation. Interviewee No.1, a neurosurgeon, said: “In the field of neurosurgery, each technological revolution is like opening a new 'cognitive black box' for doctors. When we use 3D printed vascular models for surgical rehearsals, not only does it enhance the safety of surgery, but it also discovers hemodynamic laws of blood flow at the bifurcation angles during the model optimization process; I once participated in the resection of a medullary cavernous hemangioma, where the interface between the lesion and the nerve conduction bundle was clearly identified under a two-photon microscope. This "molecular visualization" resulted in a 95% success rate from a 30% disabling rate. This spiral rise of 'technology application - clinical findings - technology improvement' is precisely the most essential driving force behind medical innovation. "

Interviewee No.3 is a cardiothoracic surgeon who, in combination with his clinical practice, says: "I am deeply aware that every innovation in surgical techniques and instruments is like opening a new 'window of life' for heart surgery - it not only reconstructs the logic of our intervention in disease, but also reshapes the innovation model of the entire field." From open-heart surgery to non-invasive interventional therapy, from cardiopulmonary bypass to cardiopulmonary bypass technology, the iteration of technology pushes heart surgeons to break through the physiological and physical limits. For example, the holographic navigation system can convert CTA data into a 3D dynamic model of the heart, and in Barlow's disease, mitral valve repair, through virtual trial fitting of different types of plastic rings, the valve engagement area is optimized by 38%. Intelligent anastomosis devices, such as CorPath GRX, use AI to calculate the optimal puncture Angle and increase the success rate of percutaneous coronary intervention through chronic complete occlusion lesions (CTO) to 92%." The above views of surgeons are also consistent with related theories, such as the theory of technological innovation (Schumpeter, 1934), which holds that technological progress is the core driving force of economic and organizational innovation; According to the theory of socio-technical systems (Trist & Bamforth, 1951), technological innovation not only changes the physical working environment, but also promotes the creation of innovation behavior by influencing the working style of employees, the decision-making process and team collaboration. The innovation and progress of surgical technology has prompted surgeons to practice innovation in the application of new technologies, overthrowing traditional treatment methods, and creating more efficient working models and treatment programs within the medical industry.

5.2.6 Explanation of Low Survey Scores

In this study, the average score for each item on the scales measuring leadership development, psychological empowerment, and innovation behavior ranged from 3.77 to 3.90, suggesting that surgeons hold a generally positive attitude toward these practices, but the degree of identification has not reached a significant level. In order to understand the

real reasons, this issue has been deeply discussed in the process of in-depth interviews with the interviewees. The main reasons are as follows:

Limited Awareness and Opportunities for Leadership Development : Hospitals appear to be in the early stages of systematically promoting leadership development among surgeons. There is a general lack of targeted training mechanisms, mentorship systems, and structured career development pathways. Interviews revealed that leadership-related training is seldom offered in municipal- or county-level hospitals. Surgeons tend to focus heavily on clinical and research responsibilities, paying relatively limited attention to leadership, especially those not in managerial positions. Some surgeons may even perceive leadership as a responsibility exclusive to administrators, thereby weakening the perceived relevance of leadership development to their career growth and reducing their agreement with related survey items.

Insufficient Mechanisms for Psychological Empowerment: Psychological empowerment comprises four integral dimensions: self-efficacy, significance, autonomy in decision-making processes, and perceived influence. Although surgeons possess a high degree of technical authority, they often lack autonomy and voice in organizational governance and institutional decision-making. Hospital culture may still be dominated by hierarchical structures or task-oriented practices, which hinder the development of a subjective sense of empowerment. Moreover, if hospitals lack transparency in resource allocation and promotion mechanisms, even highly engaged surgeons may feel they have limited control over their work or its outcomes. This lack of perceived influence and autonomy likely undermines their sense of psychological empowerment.

Innovation Behavior Constrained by Technical and Practical Limitations : Surgeons' innovation behavior typically involves improvements in surgical techniques, interdisciplinary collaboration, or breakthroughs in research design. However, such behaviors often demand significant time investment, resource support, and technological infrastructure—conditions that are often difficult to meet in daily clinical practice. The medical field's strict emphasis on safety and standardization may further restrict the spac e for innovation. Surgeons attempting new approaches may face strict ethical reviews and

risk control procedures. In addition, the current doctor–patient relationship in China and relatively low patient trust in medical professionals create a cautious clinical environment. Combined with the lack of institutional tolerance for failure, these factors may discourage surgeons from engaging in innovation, leading to more reserved responses to items related to innovation behavior.

5.2.7 Limitations of the Study

Although this research offers significant contributions to the understanding of the interplay between leadership development, psychological empowerment, and the innovation behaviors of surgeons within the framework of healthcare institutions in China, it is imperative to acknowledge several limitations that warrant consideration.

1) Limited Sample Representativeness and Ecological Validity

This study focused exclusively on surgeons, whose professional characteristics—such as high work intensity and a distinct hierarchical structure—may limit the generalizability of the findings. The sample did not encompass additional medical specialties, healthcare practitioners, or individuals not engaged in the medical profession. Furthermore, the data acquisition occurred within a distinct cultural framework in China, which may influence the generalizability of the findings across diverse cultural settings.

2) Limitations of the Study's Temporal Design

The quantitative analysis adopted a cross-sectional design, which restricts the ability to examine the dynamic and temporal mechanisms underlying the relationships among variables. Cultivating leadership competencies is an extensive and prolonged endeavor, and the effects of such development may not become evident promptly. Similarly, psychological empowerment and innovation behavior may require sustained experience and accumulation over time. The current data are therefore limited in capturing the temporal sequence and causality between these constructs.

3) Insufficient Depth in Exploring Mediating Mechanisms

Although the study confirmed the partial mediating role of psychological empowerment, it did not thoroughly examine potential moderating variables that may influence these relationships, such as organizational innovation climate or levels of professional burnout. Subsequent investigations ought to examine these variables to furnish a more thorough comprehension of the underlying mechanisms involved.

5.3 Recommendation

This study focuses on Chinese surgeons as the research subjects, exploring the impact of leadership development on surgeons' innovation behavior through the mediating role of psychological empowerment. The aim of the study is to provide valuable practical guidance for hospital managers to implement effective leadership, drive innovation among surgeons in medical practice, and help surgeons actively respond to the high uncertainty in surgical procedures. By doing so, it seeks to stimulate the innovative potential of teams and individuals, contributing to the high-quality development of the healthcare industry.

5.3.1 Recommendations for Hospital

1) Improve the Leadership Development Level of Surgeons

In hospital management, promoting the leadership development of surgeons is a key initiative for enhancing the quality of medical services, reducing doctor-patient conflicts, strengthening team collaboration, and driving innovation. This study confirms that leadership development significantly influences surgeons' innovation behavior. Under the current policy environment in China that vigorously promotes medical technology innovation and the transformation of scientific achievements, breakthroughs in surgical innovation have become a critical indicator of hospitals' core competitiveness.

However, medical innovation is often characterized by long cycles, high risks, and complex interdisciplinary collaboration, which places higher demands on surgeons' leadership. In addition to excellent clinical skills, surgeons must possess strategic planning

capabilities to identify innovation directions, communication and collaboration skills to overcome disciplinary barriers, motivational abilities to sustain innovation resilience, and continuous learning capacity to adapt to technological evolution.

The findings of this study indicate that the dimensions of strategic thinking and training contribute most significantly to leadership development. This suggests that, especially under limited resources, hospitals should prioritize building a dual-engine leadership development system driven by "strategic orientation" and "collaborative empowerment." For instance, hospital management should integrate surgeons' leadership development into the hospital's overall innovation strategy, offering training in strategic management and decision-making to help surgeons understand healthcare system operations and enhance their awareness of trends in the medical industry.

Hospitals should also provide regular communication skills training for surgeons, covering areas such as patient communication, intra-team dialogue, and interdisciplinary collaboration. For instance, surgeons can be organized to receive training at local cadre training bases for officials in China or at renowned universities in China for cadre training. Enhance the leadership skills of surgeons through methods such as action learning and case teaching. These educational programs should encompass methodologies for proficiently elucidating medical conditions to patients, strategies for managing medical conflicts, and techniques for facilitating interdepartmental collaboration. Furthermore, the conventional pedagogical approach characterized by classroom instruction requires substantial reformation. Hospitals should simulate typical scenarios such as conflicts in medical-engineering cooperation or resistance to new technology implementation, and use machine learning to generate personalized development recommendations. At the same time, they should offer up-to-date training in medical technologies, device usage, and surgical techniques to ensure that training is directly aligned with real clinical innovation challenges.

2) Enhance the Surgeon's Sense of Psychological Empowerment

As an intrinsic driving force of individual work motivation, psychological empowerment has been shown in this study to play a significant mediating role between

leadership development and innovation behavior, directly influencing surgeons' work enthusiasm and innovation engagement. Hospital administrators can systematically enhance surgeons' sense of psychological empowerment and activate their diagnostic and therapeutic innovation by constructing a triadic support system that integrates institutional empowerment, capability building, and value realization.

Given the long cycles of medical technological innovation and the complexity of interdisciplinary collaboration, this study recommends adopting a dynamic empowerment mechanism as the central breakthrough. First, hospitals should establish a co-governance network for surgical innovation decision-making, involving surgeons in technology planning, budget allocation, and outcome transformation. For example, when introducing surgical robotics, lead surgeons could be granted "clinical veto power" over functional module optimization and allocate part of the annual departmental budget directly for rapid prototyping and targeted procurement.Second, hospitals should build an agile clinical-engineering transformation platform to foster cooperation between surgeons and medical device engineers, thereby shortening surgeons' learning curves for new equipment and reinforcing their sense of control over the implementation of surgical technologies.

Meanwhile, an innovation value visualization system should be developed. This may include using AR technology in operating rooms to display real-time clinical outcome data from surgeon-modified instruments, and establishing a "Surgical Innovation Archive" that logs the entire journey from idea conception to clinical application using video documentation. Key decision points and surgeons' contributions should be prominently marked to externalize tacit knowledge, enhance professional impact, and facilitate the hospital's transformation from a technology adopter to a source of innovation.

In addition, hospitals can pilot the implementation of an attending physician responsibility system, which helps to break through the administrative constraints of the traditional three-level ward round structure. This system reinforces the central responsibility of attending physicians in the diagnosis and treatment process, thereby improving the efficiency and continuity of medical decision-making and enhancing physicians' sense of psychological empowerment. In the context of ongoing healthcare

reform in China, this approach aligns with the shift toward patient-centered care and accountability-based service delivery. It also contributes to optimizing the division of labor among medical staff, reducing the administrative burden on department heads and senior physicians, and ultimately improving the overall quality of healthcare services.

3) Strengthen Surgeons' Capacity for Innovation

Surgeons assume a progressively pivotal function in medical innovation, particularly in light of the swift progressions in medical technology. The integration of medicine and engineering not only provides surgeons with new tools and methods for innovation and significantly enhances technological progress, surgical precision, and patient outcomes. Interview findings reveal that many surgeons view strengthened medical-engineering collaboration as a key driver of surgical innovation.

Hospital administrators can enhance the effectiveness of surgical innovation by building a technology-enabled innovation system that fosters collaboration between medical and engineering disciplines. The primary source of innovation in medical-engineering integration should be rooted in frontline clinical needs. The administration ought to facilitate interdisciplinary cooperation between medicine and engineering, motivating surgeons to participate in educational programs pertinent to biomedical engineering, sophisticated medical imaging, and other innovative technological advancements. This would improve their scientific literacy and innovation capabilities, enabling them to jointly work more effectively with engineers to develop advanced and practical medical devices and technologies.

In surgical practice, advanced engineering technologies such as 3D printing allow surgeons to create personalized surgical plans and implants for patients, even printing anatomical models for preoperative rehearsal and planning. These applications improve surgical success rates and enable more precise and individualized treatment, significantly enhancing patient outcomes and postoperative recovery.

Furthermore, the promotion of interdisciplinary cooperation and the advancement of innovative practices are of paramount importance. Integrating medicine and engineering has led to the broad expansion of interdisciplinary cooperation, especially in developing medical technologies and innovations. Hospital management should establish collaborative innovation communities composed of surgeons, engineers, technical experts, and other professionals to promote deep communication and collaboration. Together, these teams can develop new medical equipment, surgical instruments, and treatment solutions. This multidisciplinary approach accelerates technological advancement and encourages surgeons to collaborate with experts from diverse fields, expanding their innovation perspectives and technical horizons.

5.3.2 Recommendations for Surgeon

1) Strengthen Leadership Practice

In the medical field, surgeons require exceptional clinical skills and outstanding leadership capabilities. In light of the conclusions drawn from this research, it is recommended that surgeons prioritize the augmentation of their leadership competencies by cultivating four essential domains: strategic thinking, communicative proficiency, motivational expertise, and engagement in professional development programs.

First, implement strategic planning. Surgeons must comprehensively comprehend the strategic developmental trajectory of their respective departments, remain apprised of contemporary industry trends, and understand the evolution patterns associated with nascent technologies and methodologies to devise long-term strategic plans effectively. For instance, with the rise of minimally invasive surgery, a forward-thinking surgeon could plan for the introduction of relevant equipment and training within the department, enabling it to gain an early advantage. Furthermore, in managing intricate clinical scenarios, surgeons must embrace a holistic approach, considering the patient's comprehensive health status, potential surgical complications, and anticipated postoperative rehabilitation to formulate thorough and judicious treatment strategies instead of concentrating exclusively on the surgical intervention itself.

Second, foster effective communication. Strong communication skills are fundamental to surgical leadership. In patient interaction, surgeons must employ unambiguous and straightforward terminology to elucidate medical conditions and therapeutic strategies, attentively heed patients' apprehensions and requirements, and deliver authentic care to foster trust and enhance compliance with treatment protocols. In team communication, whether during preoperative planning or intraoperative instructions, messages must be delivered accurately, clearly, and promptly. Surgeons should also listen actively to team members' suggestions, encourage open discussion, and create an inclusive atmosphere that fosters collaboration, essential for success in high-stakes surgical settings.

Third, energize the team and foster creativity. Surgeons can recognize achievements and uncover team members' strengths and progress through a structured recognition system, offering sincere praise to make them feel valued. For example, a young doctor who performs exceptionally during a surgical procedure should be publicly acknowledged. Setting clear and challenging goals can stimulate motivation. Upon completing complex surgeries or research projects, providing appropriate rewards, such as bonuses, certificates of recognition, or opportunities for promotion, can inspire ongoing progress by meeting material and psychological needs.

Fourth, prioritize training and development. As leaders of surgical teams, surgeons should regularly organize internal training sessions. These sessions effectively raise the team’s overall competency and pass down valuable experience. Sharing clinical insights, surgical techniques, and the latest medical research helps younger doctors develop more rapidly. Furthermore, team members must be incentivized to participate in external training programs and scholarly conferences to expand their intellectual perspectives. A well-established mentorship system can also play a crucial role: assigning experienced mentors to junior doctors for one-on-one guidance in surgical practice and career planning can comprehensively support their professional growth.

2) Build Sustainable Psychological Empowerment Mechanisms

As core executors within the modern healthcare system, surgeons play a pivotal role, and enhancing their sense of psychological empowerment is crucial for ensuring surgical quality, improving professional experience, and reducing burnout. In light of the results derived from this investigation, we advocate for implementing a comprehensive and methodical intervention framework aimed at developing a sustainable psychological empowerment paradigm. This strategy encompasses professional competence development, resilience training, and optimization of team collaboration.

First, in terms of professional competence development, a tiered skill enhancement program can be implemented. Utilizing high-fidelity surgical simulation systems, such as the Da Vinci robotic training platform, to conduct repetitive practice can significantly reduce intraoperative anxiety levels.

Second, to strengthen psychological resilience, virtual reality (VR) can be employed to simulate intraoperative crisis scenarios, such as managing sudden massive hemorrhage, paired with standardized emergency response templates to reduce anxiety caused by uncertainty. Cognitive restructuring ought to be implemented: employing Rational Emotive Behavior Therapy (REBT) alongside the ABC model to discern irrational beliefs (e.g., “I must achieve perfection”), in conjunction with daily mindfulness meditation interventions lasting ten minutes. A non-punitive postoperative review mechanism, such as Morbidity and Mortality (M&M) conferences, should be established to transform failure cases into learning opportunities, thus improving stress tolerance and alleviating anxiety.

Third, team collaboration and communication paradigms must be optimized. Defining surgical team member responsibilities and utilizing standardized communication tools like SBAR can enhance information transmission efficiency. Interdisciplinary collaboration can be improved through a fixed mentorship system, such as a joint ward round model involving anesthesiology, surgery, and ICU, boosting confidence in multidisciplinary decision-making.

Ultimately, sophisticated clinical decision support systems (CDSS) should be incorporated to amalgamate artificial intelligence with evidence-based medical practices. Where conditions permit, AI-powered imaging recognition systems (e.g., intraoperative augmented reality navigation) can be deployed to reduce visual error risks. Real-time physiological monitoring platforms—such as hemodynamic anomaly early warning systems—should be introduced to enable proactive risk management, thereby reducing stress associated with surgical complications.

3) Increase Innovation in Surgical Diagnosis and Treatment

Innovation behavior among surgeons plays a vital role in advancing medical technology, improving treatment efficiency and quality, modernizing health management, and enhancing hospitals' overall strength and service level. In interviews, most surgeons emphasized that innovation is about having ideas and taking action. From an individual perspective, surgeons must seek breakthroughs through practice, collaboration, and self-improvement, using systems thinking to drive technological innovation.

First, need-driven problem identification serves as the primary engine of innovation. Surgeons at the forefront of clinical practice have direct insight into technical limitations, procedural risks, and patient needs. Therefore, they must cultivate a "problem-awareness" mindset—by recording technical bottlenecks encountered during surgeries, collecting complication data, and tracking long-term patient outcomes—to establish a "clinical problem database." Based on this, they can propose solutions by integrating engineering and materials science principles. Such “need-driven innovation” improves the success rate of clinical translation and ensures the clinical relevance of innovation outcomes.

Second, building interdisciplinary collaboration networks is essential for overcoming technological barriers. Modern surgical innovation has evolved from single-technology improvement to multidisciplinary integration. For instance, the development of 3D-printed customized implants requires collaboration with imaging and materials science teams, while the advancement of surgical robots depends on cooperation with experts in

mechanical engineering and artificial intelligence. Surgeons should actively break down disciplinary silos by participating in industry-academia-research alliances and establishing cross-disciplinary laboratories to form stable ecosystems for collaboration. For instance, the Da Vinci Surgical System emerged from more than ten years of profound collaboration between medical professionals and engineers at Intuitive Surgical. Surgeons can begin with small-scale projects, such as working with universities to test instrument prototypes or co-developing surgical simulation software with programmers, to gradually build interdisciplinary innovation experience.

Finally, developing an internal mechanism for continuous knowledge renewal and research capacity is crucial to sustaining innovation. The pace of technological advancement in surgery is accelerating, ranging from genomics-guided precision surgery to AI-assisted decision-making systems. The ability to acquire and apply cutting-edge knowledge directly influences innovation performance. Surgeons should pursue a "dual-track model" of clinical and research development: on one hand, keeping up with global innovations through international academic conferences and online courses; on the other, mastering fundamental research methodologies, such as learning statistical software and participating in clinical trial design. This model, which combines routine clinical practice with active learning, can effectively enhance the sustainability of innovation.

5.3.3 Recommendations for Further Research

1) Cross-Cultural Comparative Studies

Future investigations ought to broaden the participant pool to encompass healthcare practitioners from diverse departments and institutions, in addition to individuals from various cultural and organizational backgrounds. This approach would augment the generalizability and ecological validity of the results while facilitating interdisciplinary and cross-cultural comparisons that could potentially uncover further insights regarding the influence of leadership development and psychological empowerment in fostering innovation behaviors.

2) Longitudinal Studies over Extended Periods

This study adopted a cross-sectional design; however, changes in innovation behavior and psychological empowerment are often gradual. Future investigations may utilize a longitudinal framework to monitor the enduring impacts of leadership development initiatives on surgical professionals. By regularly measuring psychological empowerment and innovation behavior over time, researchers can better uncover the sustained influence of leadership development and further verify the ongoing mediating role of psychological empowerment in this process.

3) Exploration of Additional Dimensions and Model Enhancement

Future research could expand the dimensions of leadership development beyond strategic thinking, communication, motivation, and training to explore other potential factors influencing innovation behavior. For example, emotional intelligence, decision-making styles, and other leadership attributes may also play significant roles in surgeons' innovation. Furthermore, subsequent investigations might incorporate a broader array of psychological and sociological paradigms to enhance the prevailing research framework, yielding a more accurate and thorough representation of the intricate interconnections between leadership development, psychological empowerment, and innovation behavior.

In conclusion, this study investigated the impact of leadership development on surgeons' innovation behavior, revealing both direct effects and the mediating role of psychological empowerment. The findings contribute to the theoretical understanding of surgical innovation and highlight the practical importance of fostering leadership capabilities among surgeons. While limitations exist, such as sample scope and contextual specificity, they provide valuable directions for future research. It is hoped that this study serves as a foundation for further academic inquiry and informs hospital leadership practices aimed at improving innovation in surgical settings.

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APPENDIX 1

QUESTIONNAIRE (EnglishVersion)

Questionnaire

THE ROLE OF LEADERSHIP DEVELOPMENT IN FOSTERING SURGEON INNOVATION BEHAVIORS: EXPLORING THE MEDIATING EFFECTS OF PSYCHOLOGICAL EMPOWERMENT IN CHINESE HOSPITALS

Researcher: Mr. Wei Xiangli

Curriculum: Doctor of Philosophy in Management, Siam University

Instruction: The purpose of this questionnaire is to understand your views and attitudes on leadership development and innovation behavior of surgeons. Your information will be kept confidential. If you have any questions or suggestions, please contact me at the following address and phone number：*Siam University 38 Phetkasem Road, Phasicharoen,Bangkok,10160Thailand ； Tel 662-867-8000 or Guangxi University of Science and Technology, Wenchang Road, Chengzhong District, Liuzhou, Guangxi, China. Tel: 18177218199*

Background: In the current rapidly changing medical environment, innovation is crucial to the career development of surgeons and the continuous improvement of medical quality. This study aims to explore how leadership development affects the innovation behavior of surgeons in China, and analyze the mediating role of psychological empowerment in this relationship.

This questionnaire has 7 pages and is divided into 5 parts as follows:

Part I: Personal Information

Part II: Leadership Development (LD-IB)

Part III: Psychological Empowerment (LD-PE)

Part IV: Innovation Behaviors (PE-IB)

Part V: Recommendation

Part I: Personal Information

Please mark on the appropriate box for the following questions.

1. What is your gender?

☐ 1) Male ☐ 2) Female ☐ 3) LGBTQ

2. What is your age in year? (years old)

☐ 1) 25-34 ☐ 2) 35-44 ☐ 3) 45-54

☐ 4) 55-59 ☐ 5) above 60

3. What is your marital status?

☐ 1) Single ☐ 2) Married

☐ 3) Divorced ☐ 4) Separated

4. What is your education level?

☐ 1) Under Bachelor Degree

☐ 2) Bachelor Degree or even

☐ 3) Postgraduate

5. What is your province?

☐ 1) Guangdong ☐ 2) Jiangsu ☐ 3) Shandong

☐ 4) Zhejiang ☐ 5) Sichuang ☐ 6) Henan

☐ 7) Hubei ☐ 8) Fujian ☐ 9) Hunan

☐ 10) Shanghai ☐ 11) Anhui ☐ 12) Hebei

☐ 13) Beijing ☐ 14) Shaanxi ☐ 15) Jiangxi

☐ 16) Liaoning ☐ 17) Chongqing ☐ 18) Yunnan

6. What is the nature of the hospital where you work?

☐ 1) Public ☐ 2) Private

7. What is the grade of the hospital where you work?

☐ 1) Tertiary hospital ☐ 2) Secondary hospital

☐ 3) First-class hospital ☐ 4) Unrated

8. What's your job title?

☐ 1) Resident Physician

☐ 2) Attending Physician

☐ 3) Associate Chief Physician

☐ 4) Chief Physician

9. What is your average monthly income? (Yuan)

☐ 1) Below 5,000 ☐ 2) 5,001 - 10,000 ☐ 3) above 10,001

10. How many years have you worked?

☐ 1) 3-5 years ☐ 2) 5- 10 years ☐ 3) above 10 years

Part II: Leadership Development（LD-IB)

Rate the following questions by placing a check in the box. Do not leave each item unanswered.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

	Level of views on points				
	1	2	3	4	5
Strategic Thinking					
1. I can identify long-term trends and opportunities for innovation in the field of surgery.					
2. I develop clear surgical strategies and follow-up plans when faced with complex surgical decisions.					
3. I can incorporate clinical data and scientific advances to develop innovative surgical programs.					
4. I regularly evaluate and adjust my team's work plan to meet new challenges and needs.					
5. I can summarize lessons learned during surgical procedures into new clinical pathways or guidelines.					
Communication					
6. I can clearly explain complex surgical procedures and the rationale for decisions to team members.					
7. I can actively listen to team members and incorporate their suggestions in pre-operative discussions.					
8. I can communicate effectively with team members during surgery to ensure a smooth operation.					
9. I can constructively communicate and mediate when team members disagree in post-operative discussions.					

	Level of views on points				
	1	2	3	4	5
Motivation					
10. I can motivate team members through clear division of labor and goal setting.					
11. I always recognize team members' efforts and contributions after surgery to motivate them.					
12. I arrange appropriate surgical tasks and learning opportunities according to the abilities and strengths of my team members.					
13. I recognize team members' needs and provide targeted feedback and coaching.					
14. I maintain team motivation and energy by creating challenging and meaningful work assignments.					
Training					
15. I can attend leadership programs and related training on a regular basis to enhance my overall competencies.					
16. I encourage my team members to participate in various business skills training.					
17. I will apply innovative ideas and practices learned in training to surgical procedures.					
18. Regular training and updating of skills is important to maintain a high level of surgical practice.					
19. I actively participate in simulated surgery and reflective learning to continually improve clinical and leadership skills.					

Part III: Psychological Empowerment（LD-PE）

Rate the following questions by placing a check in the box. Do not leave each item unanswered.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

	Level of views on points				
	1	2	3	4	5
Meaning					
20. The work I do is very meaningful to me.					
21. What I do at work is very meaningful to me personally.					
22. My work is vital to me.					
23. I feel that my work is full of personal value and meaning.					
24. My work is consistent with my personal goals and values.					
Self-determination					
25. I can decide for myself how to proceed with my work.					
26. I have great independence and autonomy in how I do my job.					
27. I have much autonomy in deciding how to accomplish my work.					
28. I can independently set work objectives and plan a path to achieve them.					
29. I have the right to choose the techniques and methods used in my work.					
Self-efficacy					
30. I have acquired the skills needed to perform my job.					
31. I am confident in my ability to do the things I do on the job.					

	Level of views on points				
	1	2	3	4	5
32. I am very confident in my ability to do my job.					
33. I am confident that I can overcome difficulties and challenges on the job.					
34. I feel that I can perform complex and important tasks efficiently.					
Impact					
35. I have a great deal of influence over what happens in my department.					
36. I have a great deal of control over what happens in my department.					
37. I have a significant influence on what happens in my department.					
38. My input is important in the department's decision-making process.					
39. My work product significantly affects the overall performance of the department.					

Part IV: I（PE-IB)

Rate the following questions by placing a check in the box. Do not leave each item unanswered.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

	Level of views on points				
	1	2	3	4	5
Idea generation					
40. I will explore opportunities to improve surgical methods, surgical techniques, or post-operative care.					

	Level of views on points				
	1	2	3	4	5
41. I will focus on non-routine problems in surgical procedures, surgical safety, or healthcare.					
42. I will develop ideas or solutions to problems.					
43. I will look at problems from different perspectives to gain deeper insights.					
44. I will test new technologies and treatments to understand unmet needs.					
Idea realization					
45. I will evaluate the advantages and disadvantages of new technologies and treatments.					
46. I will try to convince others of the importance of a new technology or treatment.					
47. I will take the initiative to promote the new technology or treatment and make it available for implementation.					
48. I will take risks to support new technologies or treatments.					
49. When applying a new technique to a patient's surgery, I will try to correct the problems created by the new method.					

Part V: Recommendation

……

THANK YOU FOR YOUR TIME AND PARTICIPATION.

APPENDIX2
QUESTIONNAIRE (CHINESE Version)

调查问卷

领导力发展在外科医生创新行为中的作用：
心理授权在中国医院的中介作用探讨

研究者：韦相立

课　程：暹罗大学管理哲学博士

说　明：本次调查的目的是了解您对领导力发展与外科医生创新行为的看法和态度。您的信息将被保密。如果您有任何问题或建议，请通过以下地址和电话联系你：Siam University 38 Phetkasem Road, Phasicharoen,Bangkok,10160Thailand；电话 662-867-8000 或中国广西柳州市城中区文昌路广西科技大学。电话：18177218199

背　景：在当前快速变化的医疗环境中，创新对外科医生的职业发展和医疗质量的持续提高至关重要，本研究旨在探讨领导力发展如何影响中国外科医生的创新行为，并且分析心理授权在此关系中的中介作用。本次问卷采用匿名调查，不用于商业和不涉及个人的隐私。我们对您回答的全部调查问卷内容承诺严格保密，请您放心作答。

本调查问卷共 5 页，分为以下 5 个部分：

第一部分：个人信息

第二部分：领导力发展 (LD-SIB)

第三部分：心理授权 (LD-PE)

第四部分：外科医生创新行为（PE-SIB）

第五部分：建议

一、个人信息

请从下面各题的选项中选择最合适的一个答案。

1. 您的性别是：

1) 男　　2) 女

2. 您的年龄是：

1)25-34 岁　　2)35-44 岁　　3) 45-54 岁　　4)55-59 岁　　5) 60 岁以上

3. 您的婚姻状况：

1) 单身　　2) 已婚

4. 您的教育水平：

1) 大专　　2）本科　　3) 研究生及以上

5.你在哪个省工作？

1）广东　　2）江苏　　3）山东　　4）浙江　　5）四川　　6）河南

7）湖北　　8）福建　　9）湖南　　10）上海　　11）安徽　　12）河北

13）北京　　14）陕西　　15）江西　　16）辽宁　　17）重庆　　18）云南

6.你工作的医院是：

1)公立　　2)私立

7. 您工作的医院等级是：

1)未定级　　2)一级　　3) 二级　　4) 三级

8. 您的职称是：

1）住院医师　　2)主治医师　　3) 副主任医师　4) 主任医师

9. 您的平均月收入是：

1) 低于 5000 元　　2)5000 -10000 元　　3) 10000 以上

10. 您的工作年限是：

1) 3 年至 5 年　　2)5 年-10 年　　3)10 年以上

第二部分：领导力发展 (LD-IB)

通过在方框中打勾来对以下问题进行评分。 请对每个问题进行回答，不要遗漏。

强烈不同意　有点不同意　中立　有点同意　强烈同意

1　2　3　4　5

	关于领导力发展态度				
	1	2	3	4	5
战略思维					
1. 我能够识别外科领域中的长期发展趋势和创新机会。					
2. 在面对复杂的外科决策时，我会制定清晰的手术策略和后续计划。					
3. 我能够结合临床数据和科研进展来制定创新的手术方案。					
4. 我会定期评估和调整团队的工作计划，以应对新的挑战和需求。					
5. 我能够将外科手术过程中的经验总结为新的临床路径或指南。					
沟通					
6. 我能够清晰地向团队成员解释复杂的手术步骤和决策依据。					
7. 我会积极听取团队成员的意见，并在术前讨论中纳入他们的建议。					
8. 手术过程中，我能够有效地与团队成员沟通，以确保手术顺利进行。					
9. 当团队成员在术后讨论产生分歧时，我能进行建设性的沟通和调解。					
10. 我能够使用适当的沟通方式来提高团队的协作和效率系。					
激励					
11. 我能够通过明确分工和目标设定来激励团队成员的积极性。					
12. 我在术后会认可团队成员的努力和贡献，以激发他们的工作热情。					
13. 我会根据团队成员的能力和特长安排合适的手术任务和学习机会。					
14. 我能够识别团队成员的需求，提供针对性的反馈和指导。					
15. 我通过创建有挑战性和有意义的工作任务来保持团队的动力和活力。					
培训					
16. 我有机会定期参加领导力课程和相关培训，以提高我的综合能力。					

	关于领导力发展态度				
	1	2	3	4	5
17. 我鼓励团队成员参与各种业务技能培训。					
18. 我会把培训中学到的创新理念和实践应用于手术过程中。					
19. 定期的培训和技能更新对保持高水平的外科实践非常重要。					
20. 我积极参与模拟手术和反思性学习，以不断提高临床和领导技能。					

第三部分：心理授权 (LD-PE)

通过在方框中打勾来对以下问题进行评分。 请对每个问题进行回答，不要遗漏。

强烈不同意　有点不同意　中立　有点同意　强烈同意

1　2　3　4　5

	关于心理授权的态度				
	1	2	3	4	5
工作意义					
21. 我所做的工作对我来说非常有意义。					
22. 工作上所作的事对我个人来说非常有意义。					
23. 我的工作对我来说非常重要。					
24. 我感到我的工作充满了个人价值和意义。					
25. 我的工作符合我的个人目标和价值观。					
自主性					
26. 我自己可以决定如何来着手来做我的工作。					
27. 在如何完成工作上,我有很大的独立性和自主权。					
28. 在决定如何完成我的工作上,我有很大的自主权。					
29. 我能够独立制定工作目标并规划实现路径。					
30. 我在工作中有权选择使用的技术和方法。					
自我效能					
31. 我掌握了完成工作所需要的各项技能。					
32. 我自信自己有干好工作上的各项事情的能力。					
33. 我对自己完成工作的能力非常有信心。					

	关于心理授权的态度				
	1	2	3	4	5
34. 我能够克服工作中的困难和挑战。					
35. 我觉得自己能够高效地完成复杂和重要的工作任务。					
工作影响					
36. 我对发生在本部门的事情的影响很大。					
37. 我对发生在本部门的事情起着很大的控制作用。					
38. 我对发生在本部门的事情有重大的影响。					
39. 我的意见在部门的决策过程中占据重要地位。					
40. 我的工作成果显著影响了部门的整体绩效。					

第四部分：外科创新行为（PE-IB）

通过在方框中打勾来对以下问题进行评分。 请对每个问题进行回答，不要遗漏。

强烈不同意　有点不同意　中立　有点同意　强烈同意

1　2　3　4　5

	关于创新行为的态度				
	1	2	3	4	5
创意生成					
41. 我会去探寻可改善手术方法、手术技术或术后护理的机会。					
42. 我会关注手术流程、手术安全或医疗领域中的非例行性问题。					
43. 我会针对问题提出构想或解决方式。					
44. 我会从不同角度看待问题，以获得更深入的见解。					
45. 我会去测试新技术、新疗法，以了解未被满足的需求。					
创意实现					
46. 我会去评估新技术、新疗法的优缺点。					
47. 我会尝试说服他人了解新技术或新疗法的重要性。					
48. 我会主动去推新技术或新疗法并使其有机会被实行。					

	关于创新行为的态度				
	1	2	3	4	5
49. 我会冒着风险去支持新技术或新疗法。					
50. 当应用新的技术于患者手术时，我会设法修正新方法所产生的问题。					

第五部分：建议

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感谢您的参与！

APPENDIX3
INTERVIEWFORM (ENGLISH Version)

Interview Form

The Role of Leadership Development in Fostering Surgeon Innovation Behaviors: Exploring the Mediating Effects of Psychological Empowerment in Chinese Hospitals

Instructions for Participants:

1. **Participants:** This study involves surgeons,hospital leader , and government officers.
2. **Consent Form:** All participants are required to sign a consent form prior to participating in the interview.
3. **Purpose and Nature of the Study:** The purpose, scope, and nature of the research will be thoroughly explained before the interview begins. Participants will have the opportunity to ask questions or seek clarification regarding the study.
4. **Rights of Participants:** Participants' rights will be clearly outlined in the consent form, including the right to withdraw from the study at any time without any repercussions.
5. **Confidentiality and Anonymity:** All information provided during the interview will be treated with strict confidentiality. Without prior written consent, participants' identities, related persons, and organizational names will remain anonymous to ensure privacy and ethical compliance.
6. **Interview Structure:** A total of 14 questions will be asked to gather valuable insights from participants, focusing on the research objectives.
7. **Voluntary Participation:** Participation in the interview is entirely voluntary. Your cooperation is highly appreciated, as it will contribute significantly to the success and relevance of this research.
8. **Ethical Considerations:** This study adheres strictly to ethical research principles. Measures are in place to protect participants' rights and ensure their well-being throughout the research process.
9. **Interview Format:** The interview will be conducted face-to-face to ensure clarity and facilitate in-depth discussion.

Your participation is invaluable to the success of this study, and your cooperation is deeply appreciated. If you have any concerns or further questions about the study or the interview process, please do not hesitate to contact the researcher. Thank you for your kind contribution to this research.

Consent Form

I, ……..…… voluntarily agree to participate in this research study.

- I understand that all information I provide for this study will be treated confidentially.
- I agree to my interview being audio-recorded.
- I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.
- I understand that I can withdraw permission to use data from my interview within two weeks after the interview, in which case the material will be deleted.
- I understand that participation involves **Leadership development and surgeon innovation behavior**.
- I have had the purpose and nature of the study explained to me in writing and I have had the opportunity to ask questions about the study.
- I understand that I will not benefit directly from participating in this research.
- I understand that in any report on the results of this research my identity will remain anonymous. This will be done by changing my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about.
- I understand that disguised extracts from my interview may be quoted in dissertation, conference presentation, and published papers.
- I understand that if I inform the researcher that myself or someone else is at risk of harm, they may have to report this to the relevant authorities - they will discuss this with me first but may be required to report with or without my permission.

- I understand that signed consent forms and original audio recordings will be retained in Siam University, Thailand by the researcher until the exam board confirms the results of the researcher's dissertation.
- I understand that a transcript of my interview in which all identifying information has been removed will be retained for two years from the date of the exam board.
- I understand that under freedom of information legalization I am entitled to access the information I have provided at any time while it is in storage as specified above.
- I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

Researcher name: Mr. Wei Xiangli

Degrees: Doctor of Philosophy in Management

Address: Siam university 38 Petkasem Road, Phasicharoen, Bangkok, 10160 Thailand; Tel 02-867-8000 or *Guangxi University of Science and Technology,Wenchang Road,Chengzhong District, Liuzhou City, Guangxi, China. Tel: 18177218199*

Signature of research participant

---------- ----------

Signature of participant Date

Signature of researcher

I believe the participant is giving informed consent to participate in this study.

Weixiangli

Signature of researcher Date

Date of interview:_____ Time:

_____

Part I: Personal Information

1. Participant name

_____

2. Contact address

_____

_____

3. Participant information

3.1 What is your gender?

☐ 1) Male ☐ 2) Female ☐ 3) LGBTQ+

3.2 What is your age in year? (years old)

☐ 1) 25-34 ☐ 2) 35-44 ☐ 3) 45-54

☐ 4) 55-59 ☐ 5) above 60

3. 3 What is your marital status?

☐ 1) Single ☐ 2) Married

☐ 3) Divorced ☐ 4) Separated

3.4 What is your education level?

☐ 1) Under Bachelor ☐ 2) Bachelor or even ☐ 3) Postgraduate

3.5 What is your province?

☐ 1) Guangdong ☐ 2) Jiangsu ☐ 3) Shandong ☐ 4) Zhejiang

☐ 5) Sichuang ☐ 6) Henan ☐ 7) Hubei ☐ 8) Fujian

☐ 9) Hunan ☐ 10) Shanghai ☐ 11) Anhui ☐ 12) Hebei

☐ 13) Beijing ☐ 14) Shaanxi ☐ 15) Jiangxi ☐ 16) Liaoning

☐ 17) Chongqing ☐ 18) Yunnan

3.6 What is the nature of the hospital where you work?

☐ 1) Public ☐ 2) Private

3.7 What is the grade of the hospital where you work?

☐ 1) Tertiary hospital ☐ 2) Secondary hospital

☐ 3) First-class hospital ☐ 4) Unrated

3.8 What's your job title?

☐ 1) Resident Physician ☐ 2) Attending Physician

☐ 3) Associate Chief Physician ☐ 4) Chief Physician

3.9 What is your average monthly income? (Yuan)

☐ 1) Below 5,000 ☐ 2) 5,001 - 10,000 ☐ 3) above 10,001

3.10 How many years have you worked?

☐ 1) 3-5 years ☐ 2) 5- 10 years ☐ 3) above 10 years

Part II: Opinion on Leadership Development

1. Can you describe if the **Strategic Thinking** (anticipate future trends and see the big picture) are related to leadership development?

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2. Can you describe if the **Communication** (transmission of information and building interpersonal relationships) is related to leadership development?

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3. Can you describe if the **Motivation** (set challenging goals and satisfying their intrinsic needs and providing external rewards) is related to leadership development?

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4. Can you describe if **Training** is related to leadership development?

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Part III: Opinion on Psychological Empowerment

5. Do you think that leadership development can influence the innovation behavior of surgeons by enhancing their **Meaning** in their work?

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6. Do you think that leadership development can influence the innovation behavior of surgeons by enhancing their **Self- Efficacy** in their work?

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7. Do you think that leadership development can influence the innovation behavior of surgeons by enhancing their **Self-Determination** in their work?

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8. Do you think that leadership development can influence the innovation behavior of surgeons by enhancing their **Impact** in their work?

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Part IV: Opinion on Surgeon Innovation Behaviors

9. Do you think **Idea Generation** can reflect the innovation behaviors of surgeon? Why?

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10. Do you think **Idea Realization** can reflect the innovation behaviors of surgeon? Why?

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Part V: Opinion on the Relationship Between Leadership development, Psychological Empowerment and Surgeon Innovation Behaviors?

11. Do you believe that **Leadership Development** has significant and positive impact on surgeon innovation behaviors? Why?

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12. Do you believe that **Leadership Development** has a significant relationship with psychological empowerment? Why?

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13. Do you believe that **Psychological Empowerment** has significant and positive impact on surgeon innovation behaviors? Why?

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14. Do you believe that **Psychological Empowerment** mediates the relationship between leadership development and surgeon innovation behavior? Why?

Part VI: Recommendation

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APPENDIX4
INTERVIEWFORM (ChineseVersion)

访谈提纲

领导力发展在外科医生创新行为中的作用：心理授权在中国医院的中介作用探讨

研究者：韦相立

课程名称：暹罗大学管理学博士

说明：

1. **参与者：**本研究涉及外科医生、医院领导和政府官员。

2. **同意书：**所有参与者在参加访谈前都需要签署同意书。

3. **研究的目的和性质：**在访谈开始前，研究的目的、范围和性质将被彻底解释清楚。参与者将有机会就研究提出问题或寻求澄清。

4. **参与者的权利：**参与者的权利将在同意书中明确列出，包括随时退出研究而不受任何影响的权利。

5. **保密和匿名：**在面试过程中提供的所有信息将被严格保密。未经事先书面同意，参与者的身份、相关人员和组织名称将保持匿名，以确保隐私和道德合规。

6. **访谈结构：**访谈共涉及 14 个问题，旨在围绕研究目标，从参与者那里收集有价值的见解。

7. 自愿参与：参加面试完全是自愿的。非常感谢您的合作，因为它将对这项研究的成功和相关性做出重大贡献。

8. 伦理考虑：本研究严格遵循伦理研究原则。已采取措施保护参与者的权利，并确保他们在整个研究过程中的健康。

9. 面试形式：面试将采用面对面的方式，以确保清晰和深入的讨论。

您的参与对本次研究的成功至关重要，非常感谢您的合作。如果您对研究或面试过程有任何疑虑或进一步的问题，请不要犹豫与研究人员联系。感谢您对这项研究的贡献。

同意书

领导力发展在外科医生创新行为中的作用：

心理授权在中国医院的中介作用探讨

我，_____自愿同意参加本研究。

我理解我为本研究提供的所有信息都将保密。

我同意对我的访谈进行录音。

我理解即使我现在同意参加，我也可以随时退出或拒绝回答任何问题，而不会产生任何后果。

我理解我可以在访谈结束后两周内撤回使用访谈数据的许可，在这种情况下，材料将被删 除。

我理解参与涉及外科医生创新行为研究。

我已以书面形式向我解释了研究的目的和性质，并且我有机会就研究提出问题。

我理解我不会直接从参与本研究中受益。 我理解在任何关于本研究结果的报告中，我的身份都将保持匿名。这将通过更改我的名字并 隐藏任何可能泄露我的身份或我所谈论的人身份的访谈细节来实现。

我理解，我的采访摘录可能会被引用到论文、会议报告和已发表的论文中。

我理解，如果我告知研究人员我或其他人有受到伤害的风险，他们可能必须向相关部门报告 此事——他们会先与我讨论此事，但可能会被要求在获得或未获得我的许可的情况下报告此事。

我理解，研究人员签署的同意书和原始录音将保留在泰国暹罗大学，直到考试委员会确认研 究人员的论文结果。

我理解，我的采访记录中所有身份信息均已删除，将从考试委员会之日起保留两年。

我理解，根据信息自由合法化，我有权在信息存储期间随时访问我提供的信息，如上所述。

我理解，我可以自由联系任何参与研究的人员，以寻求进一步的澄清和信息。

研究员：韦相立先生

学位：管理学博士

地址：暹罗大学 38 Petkasem Road, Phasicharoen, Bangkok, 10160 泰国；电话 02-867-8000 或 广西科技大学，中国广西柳州市文昌路 2 号。电话：18177218199

研究参与者签名：

_____

参与者签名　　日期：

研究人员签名：

我相信参与者已知情同意参与本研究。

_____

研究者签名　　日期：

访谈日期：　　访谈时间：

第一部分：个人信息

受访者姓名：

工作单位：

受访者信息：

1.受访者性别

□男　□女

2. 受访者年龄

□25-34　□35-44　□45-54　□55-59　□60 岁以上

3. 受访者婚姻状况

□已婚　□单身

4. 受访者教育程度

□大学本科以下　□大学本科　□研究生

5.工作省份

□广东　□江苏　□山东　□浙江　□四川　□河南

□湖北　□福建　□湖南　□上海　□安徽　□河北

□北京　□陕西　□江西　□辽宁　□重庆　□云南

6.工作医院的性质

□公立　□私立

7.工作医院的等级

□三级医院　□二级医院　□一级医院　□未定等级

8. 受访者职称

□主任医师　□副主任医师　□主治医师　□住院医师

9. 受访者月平均收入

□低于 5000　□5001-10000　□10000 以上

10.受访者工作年限

□3-5 年　□5-10 年　□10 年以上

第二部分：对领导力发展的看法

1. 你能描述一下**战略思维**（预测未来趋势并看到大局）是否与外科医生领导力发展（提升引领团队与创新能力）有关吗？

2. 你能描述一下**沟通**（传递信息和建立人际关系）是否与外科医生领导力发展有关吗？

3. 你能描述一下**激励**（设定具有挑战性的目标，满足内在需求，并提供外部奖励）是否与外科医生领导力发展有关？

4. 你能描述一下**培训**是否与外科医生领导力发展有关吗？

第三部分：对心理授权（指员工认为自己能对工作环境、工作能力、工作意义及工作自主性产生影响的程度）**的看法**

5. 你认为外科医生领导力发展可以通过提高其在工作中的**意义**（认为自己的工作有意义）来影响他们的创新行为吗？

6. 你认为外科医生领导力发展可以通过增强外科医生在工作中的**自主权**（自主决定如何完成工作）来影响他们的创新行为吗？

7. 你认为外科医生领导力发展能通过提高其在工作中的**自我效能**（相信自己具备完成工作的技能和信心）来影响他们的创新行为吗？

8. 你认为外科医生领导力发展可以通过提高其在工作中的**影响力**（对工作环境和事件有影响力和控制力）来影响他们的创新行为吗？

第四部分：对外科医生创新行为的看法

9. 你认为**创新想法产生**能反映外科医生的创新行为吗？为什么？

10. 你认为**创新想法实现**能反映外科医生的创新行为吗？为什么？

第五部分：领导力发展、心理授权与外科医生创新行为的关系

11. 您认为外科医生**领导力发展**对其创新行为有显著的积极影响吗？为什么?

12. 你认为外科医生**领导力发展**与**心理授权**有重要关系吗？为什么?

13. 您认为**心理授权**对外科医生**创新行为**有显著的积极影响吗？为什么?

14. 你是否相信**心理授权**在外科医生**领导力发展**和其**创新行为**之间起中介作用？为什么?

第六部分：建议

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APPENDIX5
QUESTIONNAIRE WITH IOC RESULT

IOC of Questionnaire

THE ROLE OF LEADERSHIP DEVELOPMENT IN FOSTERING SURGEON INNOVATION BEHAVIORS: EXPLORING THE MEDIATING EFFECTS OF PSYCHOLOGICAL EMPOWERMENT IN CHINESE HOSPITALS

Researcher: Mr. Wei Xiangli

Curriculum: Doctor of Philosophy in Management, Siam University

Instruction: The purpose of this questionnaire is to understand your views and attitudes on leadership development and innovation behavior of surgeons. Your information will be kept confidential. If you have any questions or suggestions, please contact me at the following address and phone number：*Siam University 38 Phetkasem Road, Phasicharoen,Bangkok,10160Thailand ； Tel 662-867-8000 or Guangxi University of Science and Technology, Wenchang Road, Chengzhong District, Liuzhou, Guangxi, China. Tel: 18177218199*

Background: In the current rapidly changing medical environment, innovation is crucial to the career development of surgeons and the continuous improvement of medical quality. This study aims to explore how leadership development affects the innovation behavior of surgeons in China, and analyze the mediating role of psychological empowerment in this relationship.

This questionnaire has 7 pages and is divided into 5 parts as follows:

Part I: Personal Information

Part II: Leadership Development (LD-IB)

Part III: Psychological Empowerment (LD-PE)

Part IV: Innovation Behaviors (PE-IB)

Part V: Recommendation

Instruction to do IOC

1) Please help to check IOC (Item Objective Congruence Index) and provide comment on the questionnaire.
2) Criteria to verify score is

+1 means "the measurement item is congruence with objective of study"

0 means "the measurement item is undecided with objective of study"

-1 means "the measurement item is inconsistent with objective of study"

3) It would be highly appreciated if you would return this questionnaire to the researcher to the email 37539066@qq.com by 7 October, 2024.
4) Should you have further questions, please do not hesitate to contact me. Thank you very much for your assistance.

Mr. Wei Xiangli

Name :

Unit and position :

Date :

Mobile phone number :

Part I: Personal Information

Please mark the appropriate box for the following questions.

1. What is your gender?

☐ 1) Male ☐ 2) Female ☐ 3) LGBTQ+

2. What is your age in year? (years old)

☐ 1) 25-34 ☐ 2) 35-44 ☐ 3) 45-54

☐ 4) 55-59 ☐ 5) above 60

3. What is your marital status?

☐ 1) Single ☐ 2) Married

☐ 3) Divorced ☐ 4) Separated

4. What is your education level?

☐ 1) Under Bachelor Degree

☐ 2) Bachelor Degree or even

☐ 3) Postgraduate

5. What is your province?

☐ 1) Guangdong ☐ 2) Jiangsu ☐ 3) Shandong

☐ 4) Zhejiang ☐ 5) Sichuang ☐ 6) Henan

☐ 7) Hubei ☐ 8) Fujian ☐ 9) Hunan

☐ 10) Shanghai ☐ 11) Anhui ☐ 12) Hebei

☐ 13) Beijing ☐ 14) Shaanxi ☐ 15) Jiangxi

☐ 16) Liaoning ☐ 17) Chongqing ☐ 18) Yunnan

6. What is the nature of the hospital where you work?

☐ 1)Public ☐ 2) Private

7. What is the grade of the hospital where you work?

☐ 1) Tertiary hospital ☐ 2) Secondary hospital

☐ 3) First-class hospital ☐ 4) Unrated

8. What's your job title?

☐ 1) Resident Physician ☐ 2) Attending Physician

☐ 3) Associate Chief Physician ☐ 4) Chief Physician

9. What is your average monthly income? (Yuan)

☐ 1) Below 5,000 ☐ 2) 5,001 - 10,000 ☐ 3) above 10,001

10. How many years have you worked?

☐ 1) 3-5years ☐ 2) 5- 10years ☐ 3) above 10years

Part II: Leadership Development (LD-IB)

Rate the following questions by placing a check in the box. Do not leave each item unanswered.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

	IOC from Experts						
	1	2	3	4	5	Total	Average
Strategic Thinking							
1. I am able to identify long-term trends and opportunities for innovation in the field of surgery.	1	1	1	1	1	5	1
2. I develop clear surgical strategies and follow-up plans when faced with complex surgical decisions.	1	1	1	1	1	5	1
3. I am able to incorporate clinical data and scientific advances to develop innovative surgical programs.	1	1	1	1	1	5	1
4. I regularly evaluate and adjust my team's work plan to meet new challenges and needs.	1	1	1	1	1	5	1
5. I am able to summarize lessons learned during surgical procedures into new clinical pathways or guidelines.	1	1	1	1	1	5	1
Communication							
6. I will be able to clearly explain complex surgical procedures and the rationale for decisions to team members.	1	0	1	1	1	4	0.8
7. I will actively listen to team members and incorporate their suggestions in pre-operative discussions.	1	0	1	1	1	4	0.8

	IOC from Experts						
	1	2	3	4	5	Total	Average
8. I am able to communicate effectively with team members during surgery to ensure a smooth operation.	1	1	1	1	1	5	1
9. I am able to constructively communicate and mediate when team members disagree in post-operative discussions.	0	1	1	1	1	4	0.8
10. I am able to use appropriate communication styles to improve team collaboration and efficiency department.	1	1	1	1	1	5	1
Motivation							
11. I am able to motivate team members through clear division of labor and goal setting.	1	1	1	1	1	5	1
12. I will recognize team members' efforts and contributions after surgery to motivate them.	0	0	1	1	1	3	0.6
13. I arrange appropriate surgical tasks and learning opportunities according to the abilities and strengths of my team members.	1	1	1	1	1	5	1
14. I recognize team members' needs and provide targeted feedback and coaching.	0	1	1	1	1	4	0.8
15. I maintain team motivation and energy by creating challenging and meaningful work assignments.	1	1	1	1	1	5	1
Training							
16. I have the opportunity to attend leadership programs and related training on a regular basis to enhance my overall competencies.	1	1	1	1	1	5	1
17. I encourage my team members to participate in various business skills training.	1	1	1	1	1	5	1
18. I will apply innovative ideas and practices learned in training to surgical procedures.	1	1	1	1	1	5	1
19. Regular training and updating of skills is important to maintain a high level of surgical practice.	1	1	1	1	1	5	1

	IOC from Experts						
	1	2	3	4	5	Total	Average
20. I actively participate in simulated surgery and reflective learning to continually improve clinical and leadership skills.	1	1	1	1	1	5	1

Part III: Psychological Empowerment (LD-PE)

Rate the following questions by placing a check in the box. Do not leave each item unanswered.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

	IOC from Experts						
	1	2	3	4	5	Total	Average
Meaning							
21. The work I do is very meaningful to me.	1	1	1	1	1	5	1
22. What I do at work is very meaningful to me personally.	1	1	1	1	1	5	1
23. My work is very important to me.	1	1	1	1	1	5	1
24. I feel that my work is full of personal value and meaning.	1	1	1	1	1	5	1
25. My work is consistent with my personal goals and values.	1	1	1	1	1	5	1
Self-determination							
26. I can decide for myself how to proceed with my work.	1	1	1	1	1	5	1
27. I have a great deal of independence and autonomy in how I do my job.	1	1	1	1	1	5	1
28. I have a great deal of autonomy in deciding how to accomplish my work.	1	1	1	1	1	5	1
29. I am able to independently set work objectives and plan a path to achieve them.	1	1	1	1	1	5	1

	IOC from Experts						
	1	2	3	4	5	Total	Average
30. I have the right to choose the techniques and methods used in my work.	1	1	1	1	1	5	1
Self-efficacy							
31. I have acquired the skills needed to perform my job.	1	1	1	1	1	5	1
32. I am confident in my ability to do the things I do on the job.	1	1	1	1	1	5	1
33. I am very confident in my ability to do my job.	1	1	1	1	1	5	1
34. I can overcome difficulties and challenges on the job.	1	1	1	1	1	5	1
35. I feel that I can perform complex and important tasks efficiently.	1	1	1	1	1	5	1
Impact							
36. I have a great deal of influence over what happens in my department.	1	1	1	1	1	5	1
37. I have a great deal of control over what happens in my department.	1	1	1	1	1	5	1
38. I have a significant influence on what happens in my department.	1	1	1	1	1	5	1
39. My input is important in the department's decision-making process.	1	1	1	1	1	5	1
40. My work product significantly affects the overall performance of the department.	1	1	1	1	1	5	1

Part IV: I (PE-IB)

Rate the following questions by placing a check in the box. Do not leave each item unanswered.

Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
1	2	3	4	5

	IOC from Experts						
	1	2	3	4	5	Total	Average
Idea generation							
41. I will explore opportunities to improve surgical methods, surgical techniques, or post-operative care.	1	1	1	1	1	5	1
42. I will focus on non-routine problems in surgical procedures, surgical safety, or healthcare.	1	1	1	1	1	5	1
43. I will develop ideas or solutions to problems.	1	1	1	1	1	5	1
44. I will look at problems from different perspectives to gain deeper insights.	1	1	1	1	1	5	1
45. I will test new technologies and treatments to understand unmet needs.	1	1	1	1	1	5	1
Idea realization							
46. I will evaluate the advantages and disadvantages of new technologies and treatments.	0	1	1	1	1	4	0.8
47. I will try to convince others of the importance of a new technology or treatment.	1	1	1	1	1	5	1
48. I will take the initiative to promote the new technology or treatment and make it available for implementation.	1	1	1	1	1	5	1
49. I will take risks to support new technologies or treatments.	0	1	1	1	1	4	0.8

	IOC from Experts						
	1	2	3	4	5	Total	Average
50. When applying a new technique to a patient's surgery, I will try to correct the problems created by the new method.	1	1	1	1	1	5	1

Part V: Recommendation

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THANK YOU FOR YOUR TIME AND PARTICIPATION.

APPENDIX6
LETTER FROM SIAM UNIVERSITY FOR QUESTIONNAIRE

No. SU 0210.7/247

Graduate School of Management,
Siam University
38 Petkasem Rd., Bang-wa,
Phasi-charoen, Bangkok, 10160.

December 26th, 2024

Subject: Request for Data Collection via Questionnaire Distribution
To Whom It May Concern:

Mr. Wei Xiangli Student ID# 6319200005, a doctoral student of the Graduate School of Management, Siam University (Mobile Phone No. +86-18177218199 and email: 37539066@qq.com) is currently working on the Ph.D. Dissertation entitle: "The Role of Leadership Development in Fostering Surgeon Innovation Behaviors: Exploring the Mediating Effects of Psychological Empowerment in China Hospitals" under the supervision of Dr. Karnjira Limsiritong.

In this regard, the Graduate School of Management would like to request for your cooperation by corresponding the attached questionnaire form. The completion of this questionnaire form will allow Mr. Wei Xiangli to further proceed on her research with data accuracy and overall quality. Your kind assistance is fully appreciated.

Best Regards,

(Associate Professor Dr. Chaiyanant Panyasiri)
Dean of the Graduate School of Management

Graduate School of Management
Telephone +662-867-8000 ext. 5311
E-mail: phd_m1@siam.edu

APPENDIX7
ETHICS TRAINING CERTIFICATION

CERTIFICATE

OF COMPLETION

PHRP Online Training, Inc. certifies that

Xiangli wei

has successfully completed the web-based course "Protecting Human Research Participants Online Training SBE."

Date Completed: **2023-08-14** Certification Number: **2991174**

PHRP
Protecting Human
Research Participants
Online Training

APPENDIX8
ETHICS APPROVAL CERTIFICATION

COA No. 004/2568

Certificate of Human Research Approval

Southeast Asia University

SAU Ethics Committee for Human Research has considered the following research protocol:

Protocol Code: 004/2568

Protocol Title: The Role of Leadership Development in Fostering Surgeon Innovation Behaviors: Exploring the Mediating Effects of Psychological Empowerment in China Hospitals

Principal Investigator: Wei Xiangli

SAU Ethics Committee for Human Research has considered the following research protocol according to the ethical principles of human research in which researchers respect human's rights and honor, do not violate rights and safety, and do no harms to the research participants.

1. Research Protocol
2. Participant Information Sheet
3. Informed Consent Form
4. Research Instruments

Approval Date: 12/03/2025 Approval Expire Date: 11/03/2026

Progressing Report Date: 11/03/2026

Sign .....
(Assoc.Prof. Weerapun Daungthongsuk, D.Eng.)
Chairman of the Human Ethics
Sub-Committee of Southeast Asia University, No.1

Sign .....
(Asst.Prof.Phonnipha Bonboonsuksri, Ph.D.)
Secretary of the Human Ethics
Sub-Committee of Southeast Asia University, No.1

AUTHOR'S BIOGRAPHY

Name and Surname : WEI XIANGLI

Date of Birth : October 28, 1978

Nationality : China

Birth of Place : Xiangzhou, GuangXi, China

Address : Guangxi University of Science and Technology, No. 2 Wenchang Road, Liuzhou, Guangxi, China. 545006

E-Mail 37539066@qq.com

Work Position : Head of the University Party Committee Inspection Team

Workplace : Guangxi University of Science and Technology

Education

Bachelor's Degree

Degree	Bachelor of Management
Major	Archival Science
Institution	Guangxi Minzu University
Country	China
Year	1997-2001

Master's Degree

Degree	Master of Management
Major	Administrative Management
Institution	Guangxi Minzu University
Country	China
Year	2002-2004,2010

Publishing Research :

Wei, Xiangli , Karnjira Jemmy Limsiritong, Burin Santisarn. (2026). Research on the Impact Mechanism of Leadership Development on Surgeons' Innovation Behavior: Based on The Mediating Role of Psychological Empowerment. *Journal of Educational Innovation and Research*, Volume 10, Issue 1, January – March. (TCI Tier 1)

https://so03.tci-thaijo.org/index.php/jeir

Wei, Xiangli. (2020). A study on the path to improving the capabilities of middle-level administrators in local universities from the perspective of action learning. *Labour Security World*, (12), 50.

(1) เรียน ท่านรองอธิการบดี

สำนักส่งเสริมและพัฒนางานวิจัยได้ตรวจสอบวารสารที่นักศึกษา (Mr. Wei Xiangli) นำบทความไปตีพิมพ์แล้ว พบว่า “วารสารนวัตกรรมการศึกษาและการวิจัย” อยู่ในฐานข้อมูล TCI กลุ่ม 1 ตามที่ระบุจริง โดยเป็นวารสารที่ออกทุก 3 เดือน ปัจจุบันเผยแพร่ฉบับ ปีที่ 9 ฉบับที่ 2 (เม.ย.-มิ.ย. 2568) แต่ของ นศ.จะเผยแพร่ในปีที่ 10 ฉบับที่ 1 (ม.ค.-มี.ค. 2569)

ทั้งนี้ นศ. ได้แนบหลักฐานการติดต่อสื่อสารกับทางวารสาร ซึ่งทำให้เห็นกระบวนการนำส่งบทความเพื่อรับการพิจารณา เป็นที่มาของใบตอบรับการตีพิมพ์ที่แนบมานี้ด้วย

จึงเรียนมาเพื่อโปรดพิจารณา

(ลงชื่อ)

(ดร.วนิดา เลิศพิพัฒนานนท์)
ผู้อำนวยการสำนักส่งเสริมและพัฒนางานวิจัย
25 กรกฎาคม 2568

(2) เรียน ผ.กิตติคุณ ดร. ... Mr. WEI XIANGLI นักศึกษา ... [illegible]

7 ส.ค. 68

(3) เรียน ผ.กิตติคุณ ดร.ชนิสา รักษ์พลเมือง
การหลักสูตรฯ ขอนำส่งเอกสารขอสำเร็จการศึกษา ของ Mr. Wei Xiangli ที่ผ่านการตรวจสอบแล้ว
มาส่ง ณ วันที่ 7 ส.ค. 2568

(ลงชื่อ)

บัณฑิตวิทยาลัย สาขาวิชาการจัดการ
- 7 ส.ค. 2568

(4) เห็นควรอนุมัติ
(ลงชื่อ)
10 ส.ค. 68

(5) ตรวจงานของนศ. ... แล้ว
(ลงชื่อ)
19 ก.ย. 68

(6)
สำนักงานอธิการบดี
เอกสารฉบับนี้สามารถอัปโหลดเข้าฐานข้อมูลได้
ลงชื่อ (ลงชื่อ)
วันที่ 12/9/68