

LEADERSHIP OF CHIEF TECHNOLOGY OFFICER FOR
SUSTAINABLE GROWTH OF HIGH TECHNOLOGY
ENTERPRISES IN GUANGXI PROVINCE

LYU GAIZHI

A thesis submitted in partial fulfillment of the requirements for Doctor
of Philosophy Program in Technology and Innovation Management

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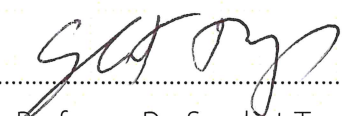
Thesis Title Chief Technology Officer's Leadership for Sustainable Growth of High-technology Enterprises in Guangxi Province

Author Mr.Lyu Gaizhi

Thesis Committee



..... Chairperson
(Associate Professor Dr. Pong Horadal)


..... Committee
(Assistant Professor Dr. Kanakorn Sawangcharoen)

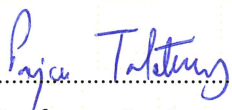

..... Committee
(Associate Professor Dr. Sombat Teekasap)


Accepted by Bansomdejchaopraya Rajabhat University in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Technology and Innovation Management

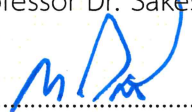

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..... Chairperson
(Associate Professor Dr. Panjai Tantatsanawong)


..... Committee
(Associate Professor Dr. Sakesun Yampinij)


..... Committee
(Associate Professor Dr. Somkiat Korbuakaew)

Title	Leadership of Chief Technology Officer for Sustainable Growth of High Technology Enterprises in Guangxi Province
Author	Lyu Gaizhi
Program	Technology and innovation Management
Major Advisor	Associate Professor Dr. Pong Horadal
Co-advisor	Assistant Professor Dr. Kanakorn Sawangcharoen
Co-advisor	Associate Professor Dr. Sombat Teekasap
Academic Year	2023

ABSTRACT

The objective of this research was to identify the leadership ability for chief technology officer of sustainable growth High-tech enterprises in Guangxi Province. The research method adopted the ethnographic Delphi future research (EDFR) method, and invited 17 experts including chief technology officers and leadership management experts to participate.

The results were found that:

1. The research identifies and analyzes key leadership factors influencing the sustainable development of high-tech enterprises, culminating in a proposed leadership model aimed at fostering their sustained growth.

2. The study explores avenues for promoting the development of high-tech industries through enterprise efforts, contributing to China's modernization goals. Through deeper insights into high-tech enterprise leadership, this research seeks to provide valuable guidance for nurturing leaders capable of steering enterprises through future challenges.

Keywords: Leadership of chief technology officer; Sustainable growth high technology enterprises; Delphi

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Contents

	Page
Abstract.....	i
Acknowledgement.....	ii
Contents.....	iii
List of Figures.....	v
List of Tables.....	vi
Chapter	
1 Introduction.....	1
Rationale.....	1
Research Question.....	2
Research Objective.....	2
Scope of the Research.....	3
Advantages.....	3
Definition of Terms.....	4
Research Framework.....	5
2 Literature Review.....	6
Leadership Theory.....	6
High-tech enterprises.....	24
Theory of sustainable development.....	29
Chief Technology Officer.....	32
Delphi Study.....	34
21st Century Skills.....	34
Related Research.....	44
3 Research Methodology.....	55
Population Group and sample Group.....	56
Research Instruments.....	57
Open-ended interview (Round 1).....	58
Questionnaire (Rounds 2 and 3).....	58

Contents (Continued)

	Page
4 Results of Analysis	61
Round 1.....	63
Round 2.....	74
Round 3.....	86
5 Discussion Conclusion and Recommendations	144
Conclusion.....	144
Discussion.....	146
Recommendations	148
References	151
Appendices	155
A List of Specialists and Letters of Specialists Invitation for IOC Verification.....	156
B Official Letter.....	160
C Research Instrument.....	166
D The Results of the Round 1 and Round 2.....	315
E Training Program.....	368
F Certificate of English.....	374
G The Document for Accept Research.....	376
Researcher Profile	378

List of Figures

Figure	Page
1.1 Research Framework.....	5
3.1 Details of the research process step.....	56

List of Tables

Table	Page
2.1 Leadership characteristics of managers in new technology enterprises.....	36
2.2 Culture based leadership factors of middle managers.....	39
2.3 Leadership factors of middle-level managers based on the organizational structure of high-tech enterprises.....	41
2.4 Leadership factors of middle managers based on subordinate Characteristics.....	43
2.5 Literature on the factors.....	49
4.1 Modified and deleted items of The qualities and abilities that chief technology officers in high-tech enterprises should possess.....	76
4.2 Deleted items of sustainable development strategies that high-tech enterprises need to possess.....	79
4.3 Modify items of chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises.....	84
4.4 Modify items of Prediction of the Future Role of chief technology officer.....	85
4.5 The result of Round 3: the qualities and abilities that chief technology officers in high-tech enterprises should possess.....	87
4.6 The result of round 3: Sustainable development strategies that high-tech enterprises need to possess.....	99
4.7 The result of round 3: chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises.....	106
4.8 The result of round3: Prediction of the Future Role of Chief Technology Officer.....	114
4.9 The summary of the qualities and abilities that chief technology officers in high-tech enterprises should possess.....	116
4.10 The summary of sustainable development strategies that high-tech enterprises need to possess.....	128
4.11 The summary of prediction of the future role of chief technology officer.....	142

Chapter 1

Introduction

Rationale

Since the 1970s, sustainable development has increasingly attracted the attention of governments, investors, enterprises, consumers and other sectors. Although there is no universally agreed definition of sustainable development, the definition proposed in the Brundtland Report is widely accepted. The report defines sustainable development as "not only meeting the needs of contemporary people, but also not damaging the ability of future generations to meet their own needs" (Keeble, 1988).

China's economy has experienced 30 years of rapid development, and its development model has evolved from a crude model to a new normal of high-quality models. High-tech enterprises are the main force for high-quality development. The government has always attached great importance to the development of high-tech enterprises and industries. It has issued a large number of relevant policies and invested a large amount of funds to subsidize related industries. High-tech enterprises have become an important engine for promoting China's economic development. There were 1,203 high-tech companies listed in China in 2020, and 1,059 companies received financial subsidies that year, accounting for 88.02% (Yuan Yuhuan, 2022). According to Torch statistics, among the industrial enterprises above designated size in Guangxi, high-tech enterprises only account for 17%, but they contribute about 40% of the total operating income, about 30% of the total industrial output value, and about 30% of the total profit to the local economy. (Closed, 2023).

Due to the impact of the COVID-19 epidemic and the continuation of the Sino-US trade war, government policies have become tense and it is unable to continue to increase subsidies for high-tech enterprises. The CSMAR database of government subsidy projects for high-tech enterprises shows that the amount of state financial subsidies received by listed high-tech enterprises has decreased year by year since 2017, reaching a maximum of 13.5 billion yuan in 2017 (Yuan Yuhuan, 2022).

The biggest challenge faced by enterprises after COVID-19 is the lack of leaders with higher leadership. Every enterprise needs those leaders with higher leadership to achieve its goals. The greatest role of a leader in an enterprise is to give play to his leadership.

The concept of high and new technology appeared in the 90s. Although China's high-tech enterprises started late, they have become a new growth point of China's sustained, healthy and rapid economic development due to their strong vitality (Shi Yu, 2009). Whether high-tech enterprises can stand firm in the fierce international competition and compete directly with international giants depends to a large extent on the leadership level of managers.

According to modern enterprise theory, an enterprise is a series of contractual connections and a cooperative organization composed of real people. In this cooperative organization, senior managers are in a critical position (Zhao Ping & Luo Yujian, 2000). The degree of enthusiasm of the management directly affects the development and profitability of the enterprise. In the management team, the chief technology officer, as the top manager of the technology system and the most important human capital, plays a key role in the process of enterprise innovation.

The focus of this research was to address the skills and techniques leadership training with Delphi technique should include to gain the benefits of sustainable growth of high-tech enterprises in Guangxi Province. The purpose is to explore an idea of promoting the development of high-tech enterprises through the efforts of enterprises themselves, especially the efforts of enterprise leaders, in addition to policy-led promotion of the development of high-tech enterprises, thereby promoting the development of high-tech industries. Finally realize China's modernization.

Research Question

What should the Leadership for sustainable growth of high-tech enterprises be?

Research Objective

To identify the leadership ability for chief technology officer of sustainable growth High-tech enterprises in Guangxi Province

Scope of the Research

Content and theory

In the research, researchers determine the scope of content and documents by studying academic articles, research articles, books, government documents, and relevant research. And information from reliable Internet websites, and related to innovation in Leadership for sustainable growth of high-tech enterprises management.

Then EDFR (Ethnographic Delphi Future Research) type prospective research method is adopted, which requires a number of expert studies to collect data. 17 people, the error is reduced to 0.02 (Macmillan, 1971).

The sample group is 17 persons who is the chief technology officer in high-tech enterprises or someone who have expertise in leadership management.

Population scope

The chief technology officer in high-tech enterprises or someone who have expertise in leadership management.

Location

Guangxi Province of China

Time

The research time is from March 2023 to September 2023.

Advantages

To plan for addressing guidelines for sustainable leadership training that will allow for improved business leadership regarding the alignment of organizational mission and leadership style.

To plan for bridging the divide between research models and practical training.

Definitions of Terms

Leadership for sustainable growth

Researchers believe that leadership for sustainable growth refers to the ability of leaders to adapt to the new normal by stimulating innovation, improving efficiency, and making overall consideration. It is a dynamic and developmental leadership that respects the past, is based on the present, and is future-oriented. It mainly includes charisma, foresight, influence, control, cultural management ability, team building ability, ability to focus on the development of subordinates, and scientific research ability.

High-tech enterprises sustainably grow

The sustainable development of technology enterprise innovation ecosystem refers to the evolutionary process of creation, growth, maturity and decline based on the innovation ecosystem. This sustainable development is determined by the internal mechanism of the innovation ecosystem and the external environment, and is determined by the internal mechanism of the innovation ecosystem and the external environment. Not all innovation ecosystems will decline. The key to maintaining activity and maintaining the sustainable development of the ecosystem lies in whether innovative factors can be introduced in a timely manner to maintain the vitality of the system and form a complete sustainable development mechanism. (Su Yi & Liu Min, 2018)

Chief technology officer

The scope of chief technology officer defined in this paper is vice president in charge of technology, president of enterprise research institute, director of R&D, senior engineer and chief engineer. Its work is accountable to the Chief Executive Officer (CEO). chief technology officer registered by Guangxi Science and Technology Department.

Delphi Study

Delphi Study is a structured decision support technology. Its purpose is to obtain relatively objective information, opinions and opinions through independent and repeated subjective judgments of multiple experts in the process of information collection.

Research Framework

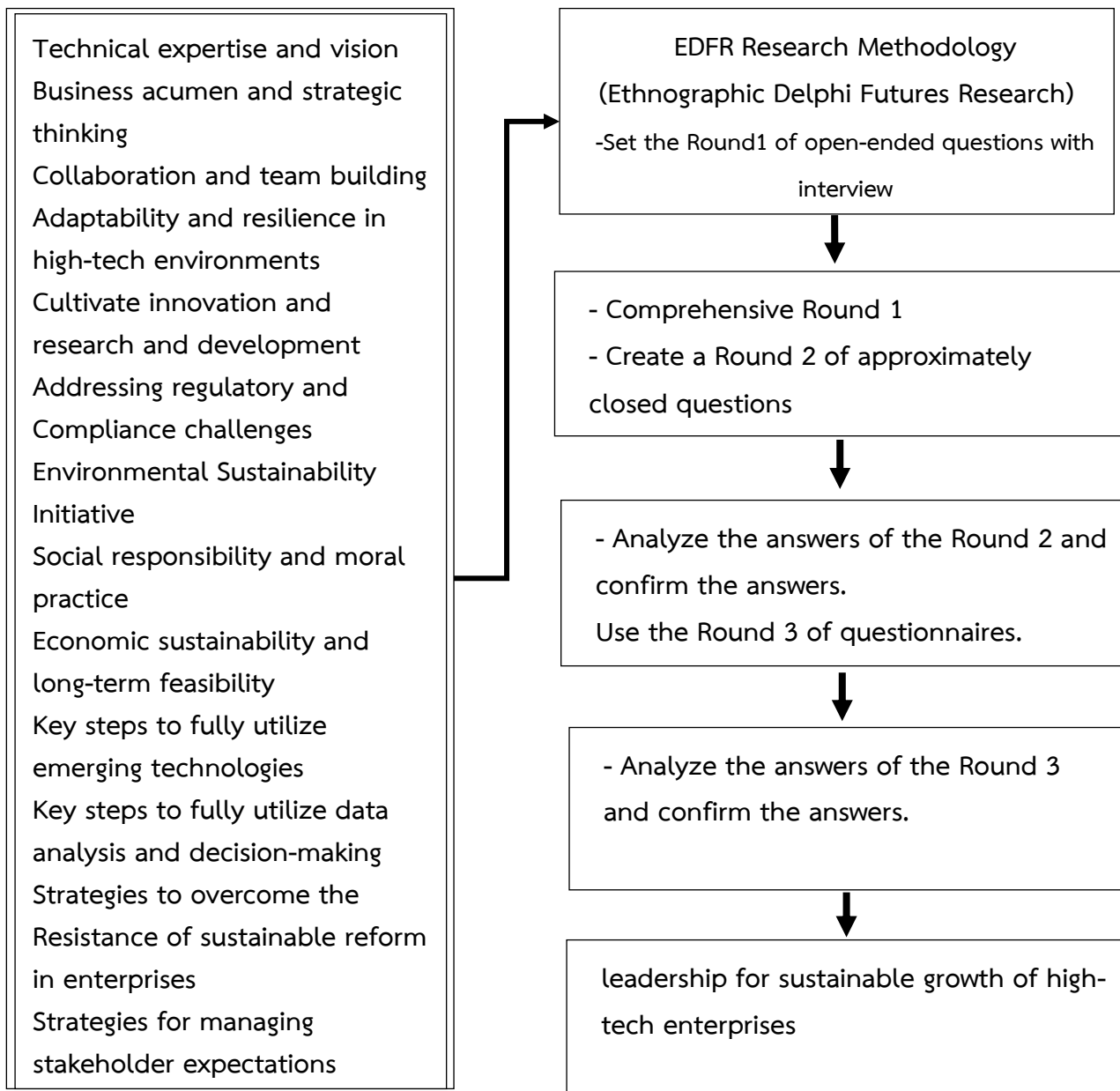


Figure 1.1 Research Framework

Chapter 2

Literature Review

Research topics are o address the skills and techniques leadership training with Delphi technique should include to gain the benefits of sustainable growth of high-tech enterprises in Guangxi Province. The researcher has studied the concepts and related theories and presented on the following topics

1. Leadership theory
2. High-tech enterprises
3. Sustainable development
4. chief technology officer
5. Delphi Study
6. Related Research

Leadership Theory

In leadership theory research, "leadership" is a ubiquitous yet crucial concept. Defining the fundamental meaning of "leadership" serves as the logical foundation for theoretical exploration in this field. Consequently, nearly all leadership researchers strive to elucidate and define the essence of "leadership." Through a literature review, this study found that although definitions provided by different scholars vary in perspective, content, and form, each definition reflects the scholars' cognition and experience. A systematic review, induction, and analysis of these concepts and definitions is an essential part of leadership-related research. Regarding the definition of "leadership," some scholars, from a power perspective, define leadership as a form of power and believe it symbolizes identity, authority, or status, whether innate or conferred by an organization. For instance, Dupin asserted that "leadership is the authority and decision exercised by leaders," while K. Young stated that "the essence of leadership is a form of governance, controlled more or less voluntarily under the influence of leaders." From a behavioral perspective, some scholars define leadership as the activities or behaviors that influence subordinates. For example, Terry (2000) proposed that "leadership is the behavior that affects team members' voluntary efforts to achieve organizational goals". From the perspective of

process, some scholars define leadership as a dynamic implementation process. For example, Warren G. Bennis (1985) pointed out that "leadership is a process that enables subordinates to carry out activities in a predetermined way". Pierce (2004) believed that "leadership is actually a process in which leaders exert influence on organization members and promote them to strive for common goals". In his book *Leadership in Early Education*, the Australian educator Jillian Rodd (2006) defined the concept of leadership as "leadership can be described as a process in which leaders set specific standards and expectations and influence others to move towards established goals". From the perspective of influence, some scholars believe that leadership is the influence of individuals on others. For example, Tannenbaum (1961) proposed that "leadership is a kind of influence to achieve a certain goal through the exchange of views in a certain situation". Argyris (1996) pointed out that "leadership is effective influence. In order to ensure the effective implementation of leadership, leaders should have a deep understanding of their influence ability".

The concept of "leadership" is closely related to "management." Etymologically, "management" emerged with the industrialization of large-scale production. In modern society, management is ubiquitous. Since management became an independent science in the late 19th and early 20th centuries, it has been interpreted from various perspectives. American management scientist Herbert A. Simon (1982) posits that "management is decision-making," emphasizing the critical role of decision-making in management. He argues that incorrect decisions render even the best management practices ineffective, and higher management efficiency could exacerbate losses. This study contends that while management includes decision-making, it is not synonymous with it. James H. Donnelly, Jr. (1982) and others view "management as a series of organizational activities carried out by one or more members to coordinate their people to achieve work outcomes unattainable by individual efforts alone." This perspective highlights the importance of organizational activities where individuals coordinate others to achieve effective work. It recognizes that coordination is essential in management to achieve organizational goals. However, it should be noted that management is not solely about coordinating others' activities. Daniel A. Wren (1985) defines management as "leveraging the functions of certain individuals to efficiently allocate, acquire, and apply human and material resources to achieve the organization's set goals."

Effective management behavior is an "intangible resource" that can accelerate goal achievement. Nonetheless, if control is disregarded in the management process, it will fail to measure and correct deviations from organizational goals, leading to potential discrepancies. Some scholars describe management as ensuring employees perform their tasks well. This view, however, does not emphasize the crucial role of managers in the management process and fails to address the objectives and fundamental reasons for implementing management.

From this perspective, we view management as a dynamic and creative activity whereby managers effectively integrate and allocate organizational resources (human, financial, material, time, information, etc.) to achieve the organization's established development goals. The core of management lies in the effective integration of these resources. Effective integration involves clarifying the responsibilities of all staff in alignment with the organization's development goals, ensuring the rational distribution and utilization of human, financial, and material resources to keep the organizational system operating optimally. Additionally, management encompasses various operational processes such as planning, organizing, controlling, directing, and coordinating. The driving force behind management is the realization of dynamic and innovative organizational operations.

Leadership has consistently been a popular subject of discussion and analysis. Various perspectives, including traits, styles, behaviors, influence, and roles, have been used to explain leadership. However, due to the inherent complexity of leadership, there is no specific, widely accepted definition within the academic community, and it is unlikely that one will emerge in the future. For instance, Fred Fiedler (1971), the founder of contingency management, noted that "there are many concepts of leadership, nearly as many as there are theories of leadership, and the number of theories is almost equal to the number of researchers in the field of leadership." Despite the absence of a unified definition, it remains essential to systematically analyze and understand the essence of leadership before researching leadership-related issues.

Regarding the definition of leadership, two main academic perspectives prevail both domestically and internationally: "ability theory" and "process theory." Firstly, proponents of "ability theory" focus on leadership as a leader's personal capability. For example, Kouzes and Posner (2012) describe leadership as

the ability of leaders to motivate and inspire subordinates to voluntarily make exceptional contributions within an organization. Dong Wenqi (2005) argues that leadership is a fundamental requirement for leaders in an organizational system, enabling them to effectively influence others' behaviors and wield corresponding management authority. Huo Guoqing, Meng Jianping, and Liu Sifeng (2008) define leadership as the ability of leaders to effectively attract and influence subordinates and all stakeholders in a specific context to continually achieve the group's or organization's established development goals. The second perspective is "process theory." Hersu Paul (2006), founder of the Center for Leadership Studies (CLS), asserts that leadership is an organizational process wherein leaders continuously and effectively influence others. John Antonakis (2008) elaborates that the definition of leadership can fundamentally be based on two points: the interaction between leaders and subordinates and the outcomes of this interaction, and the explanation of the leadership process through leaders' personality traits, leadership styles, followers' cognitive habits, and organizational contexts. Scholars Du Yuan and Liu Meifeng (2009) suggest that leadership is an organizational process in which managers define organizational development goals for the team and all members, exerting influence through specific organizational behaviors, so that members voluntarily accept and strive towards these goals.

When it comes to the concept of "leadership", we must pay attention to "leadership effectiveness". Scholars with different leadership efficacy have different cognition and understanding. Stogdill (1974) and Bass (1990) conducted a meta-analysis of at least 5000 research literatures involving the concept of leadership effectiveness, and found that scholars' interpretation of the connotation of leadership effectiveness was quite different.

Cooper and Nirenberg (2004) define leadership effectiveness as the successful application of influence by an individual or organizational group on others to promote the achievement of organizational goals in a manner satisfactory to those affected. In essence, leadership effectiveness encompasses the personal qualities, behavioral capabilities, work status, and outcomes of leaders as they implement leadership to achieve objectives. Yukl (2010) notes that most researchers assess leadership effectiveness based on the impact leaders have on individuals, organizations, teams, or groups. Common indicators for evaluating leadership

effectiveness include the degree to which a leader enhances organizational or team performance and achieves organizational goals. Leadership performance is evaluated through both subjective and objective measures. Objective performance indicators can be quantified using specific data, such as production efficiency, profit margins, return on investment, and cost control. In contrast, subjective performance indicators are typically derived from the evaluations of a leader's superiors, subordinates, and peers.

To evaluate leadership effectiveness, various indicators can be considered, primarily focusing on subordinates' perceptions and attitudes towards their superior leaders. These indicators encompass the extent to which leaders meet subordinates' expectations and demands, the level of respect, recognition, and affection subordinates have towards their leaders, perceptions of fairness and justice, willingness to proactively fulfill assigned tasks, and the leader's ability to support subordinates' professional growth and confidence-building endeavors. These indicators can be assessed through questionnaires and interviews, while indirect signs of leadership effectiveness may manifest in subordinates' dissatisfaction and hostility towards their leaders, such as frequent complaints, lack of motivation, damage to office facilities, and requests for transfer. Additionally, leaders' contributions to organizational development, as perceived by others, serve as another key measurement of leadership effectiveness. This includes evaluating whether leaders effectively enhance organizational cohesion, member self-confidence, and cooperation, as well as their ability to facilitate the organization in achieving established goals, enhancing decision-making capabilities, and resolving conflicts constructively. Furthermore, leaders' success in advancing individual careers within the organization is significant, gauging factors like rapid promotion, successful retention of leadership positions, or securing new, higher-level leadership roles. Upon examining the nuances of leadership and leadership effectiveness, it becomes evident that they share considerable overlap in meaning and significance. Leadership effectiveness is essentially a prerequisite for meaningful leadership; without it, leadership lacks substance. Thus, leadership and leadership effectiveness are interdependent and complementary. Nonetheless, distinctions exist between them; while leadership effectiveness primarily emphasizes goal orientation and outcome

evaluation, leadership encompasses process-oriented and dynamic attributes alongside results-driven focus.

Personality trait theory

The research thought of trait theory can be traced back to the temperament type theory in ancient Greece. In the early stage, the theory simply classified individuals into a certain type is the earliest embryonic form of personality traits, but this either or classification method does not accord with the actual situation of individuals. Due to people's unremitting pursuit and exploration of individual behavior and personality structure, the theory of personality traits was officially born in the United States in the 1940s. Compared with the theories of humanism, cognitive schools, behaviorism and psychoanalysis, scholars who hold the view of personality trait theory are more interested in the causes of individual behavior differences. They are good at traditional expressions based on conventional experience and use personality traits to describe individual behavior differences. Therefore, later researchers tried to decompose or synthesize the personality structure, and many classic views and structures of personality traits emerged successively.

Connotation of personality traits

The word "personality" originated from ancient Greece. In the early stage, it specifically refers to the masks worn by dramatic actors. Carl Jung, a scholar, believes that the basic connotation of personality includes two basic dimensions: one is superficial personality, that is, individual role-playing or "personality mask"; The second is the deep personality, that is, the individual's "true self". As for personality, there are similar expressions in ancient Chinese, such as "character" and "human nature", to the effect of "human virtue or quality". Correspondingly, western scholars usually use personality structure to represent and interpret the connotation of personality, and define personality as a fusion of multiple traits. Influenced by this, scholars of personality trait theory believe that traits are owned by individuals and affect their behavior characteristics or qualities. They act as a general and relatively stable behavior tendency and are mainly used to distinguish their unique personality from others. And each individual has a unique personality, which is generated by the interaction of congenital inheritance, acquired cultivation and environmental factors. With the deepening of theoretical research, people's research on personality traits

has become one of the important directions in the field of psychology, especially the exploration and Research on the connotation of personality traits constitute an important aspect of psychology's research on personality traits. In 1937, Allport, a famous American psychologist, systematically described the concept of personality traits in his book "pattern and growth in personality": "personality traits are the dynamic composition of the internal physical and mental system of individuals, which determines the consistency, stability and uniqueness of individual specific thoughts and behaviors". As for the "dynamic composition", Allport further pointed out that although personality traits can be produced, grown and cultivated in an organized and regular way, and the "physical and mental system" is a unity generated by the joint action of psychology and body. Therefore, personality traits are neither psychological nor physiological characteristics in a complete sense, but a community composed of psychological and physiological characteristics; In addition, "decision" is the force of personality traits, which can trigger or maintain individual specific ideological activities and behaviors; "Specific behavior and thought" means that everything people think, think and do is unique or unique to people, that is, every individual and every thing is unique. On this basis, Allport also listed some other characteristics of personality traits, such as "personality traits can determine or trigger individual behavior", "people can observe the existence of personality traits by observing the stable and consistent response of individuals to the same or similar stimuli", and "whether personality traits can change with the change of situation or external conditions".

Structure of personality traits

Allport personality trait structure:

Allport divided personality traits into three dimensions: pivotal trait, core trait and secondary trait according to the degree of importance. Among them, Allport believes that pivot trait is the most representative and general set of personality traits possessed by individuals themselves; Correspondingly, the core trait is composed of several relatively important personality traits; The secondary trait is a series of less important personality traits that can be presented in special circumstances. Allport pointed out that different individuals have different contents and external manifestations of hub type traits, core type traits and secondary type traits. On this basis, Allport further proposed a method to divide common traits and

unique traits according to whether the object is an individual or a group. Specifically, personality traits are divided into two types: individual trait and common trait. Among them, Allport believes that personal traits are unique to individuals and are specifically used to represent individual level behavioral tendencies. The common trait is the common trait of all group members under a common cultural background, and the common behavior orientation of individuals with the same values, experiences, hobbies or habits. Generally speaking, the common characteristics, like social standards and social concepts, will change with time. Allport further pointed out that personality is a combination of different traits. Traits and traits complement each other, but are independent of each other. Therefore, different individual behaviors will have different performances.

Cattell 16 personality trait factors:

The 16 personality traits of Cattell are the same as Allport's view. On the basis of Allport's research results, Cartel interpreted personality traits as the persistent and stable reaction tendency of individuals. However, unlike Allport, Cartel classifies personality traits into two types according to their persistence, consistency and stability: superficial personality traits and root personality traits. Among them, surface personality traits refer to the dominant characteristics of individuals' personality, which are directly related to the organizational situation and usually change with the change of the situation, and are externally observable behavior tendencies. Although these traits are interrelated, they cannot form a complete personality structure. Because the generation of these characteristics is not determined by a single source, for example, the surface characteristics of neuroticism are derived from multiple influencing factors such as uncertainty, fear, anxiety and indecision. Cartel believes that the root trait corresponds to the surface personality. This type of personality trait is hidden behind the surface trait and deep in the inner layer of personality trait, which is the integral factor of personality trait. Because of its strong stability, persistence and concealment, root traits are not easy to be observed and measured directly, and can only be found and measured by using surface traits as the medium and factor analysis. Cartel further pointed out that different types of root cause traits are independent and have little correlation with each other, and these traits generally exist in individuals of all ages and in different social environments. In addition, Cartel research found that one-third of personality traits

are determined by genetic factors, while the remaining two-thirds of personality traits are determined by the external environment, and with the increase of age, individual personality traits have strong consistency, continuity and stability.

Eysenck's hierarchical theory of personality structure:

Similar to Cartel's research method, Eysenck used the traditional experimental psychology method and factor analysis method to explore the problem of personality traits, and formed his own relatively systematic and perfect theory of personality traits. In the structure of human personality, Eysenck pointed out that "personality is the sum of behavior patterns and behavior characteristics presented by an individual as a complete life in daily learning, life and work". Eysenck believes that the sum of behavior patterns includes concept, character, temperament, intelligence and physique. Based on this, Eysenck further proposed a five-dimensional personality structure with psychoticism, conservative radicalism, extroversion introversion, neuroticism and intelligence as the core, and took neuroticism, extroversion introversion and psychoticism as the three most basic dimensions of personality traits. After studying anxiety, self-improvement and emotionality, Eysenck pointed out that these three dimensions should be classified into the same dimension, that is, neuroticism dimension. Individuals with high neuroticism tendency (emotional instability) are moody, easily excited, and often troubled and anxious. Individuals with low neuroticism tendency (emotional stability type) respond slightly and slowly, and are easy to restore calm. Eysenck pointed out that the neuroticism dimension and psychoticism together can effectively represent various psychoses and neuroses. The extroversion introversion dimension is related to individual differences in impulsivity and sociality. Eysenck's research found that individuals with high introversion tend to have a slower, shorter duration and weaker intensity of the excitation process, while the inhibition process occurs faster, longer duration and stronger intensity. Individuals with such personality traits are difficult to form conditioned reflex. Correspondingly, individuals with high extraversion tendency showed that the excitation process occurred faster, lasted longer and had stronger intensity, while the inhibition process occurred slower, lasted shorter and had weaker intensity. Therefore, individuals with high extraversion tend to form conditioned reflex. Based on the three basic personality dimensions of neuroticism, psychoticism and extroversion introversion, Eysenck successfully

developed the famous Eysenck Personality Questionnaire (EPQ) in 1975. As an objective test scale, this scale was once a special measurement tool for measuring personality dimensions and was widely used by scholars.

Big Five personality trait structure:

The embryonic form of the big five personality trait structure can be traced back to the research done by Fiske in 1949. Fiske used factor analysis to reduce the 35 surface traits proposed by Cattell into five dimensions of personality traits and formally proposed the embryonic form of the big five personality traits structure, which officially opened the prelude to the study of the five factor personality traits structure model. After that, Digman (1965) and Goldberg (1981) respectively found that the five factors of personality traits can systematically construct the structure of personality traits, but at that time, the expression of the name and connotation of the five factors of personality traits was not unified enough. Until 1987, Costa et al. Proposed a five factor structural model by extracting factors from words describing personality traits in natural language. On this basis, they developed a special measurement tool for measuring personality traits. The personality trait measurement tool developed by Costa et al. Initially included only three basic dimensions: openness, extroversion and neuroticism. Later, it was gradually integrated into the research results of other scholars, such as adding the two basic dimensions of responsibility and agreeableness. Thus, it formed a structural model containing five personality traits, marking the final establishment of the big five personality trait structure. Corresponding to the relevant studies abroad, the domestic research on the theory of personality traits started late, and the exploration and Research on personality traits focused on the introduction, translation, revision or direct use of western personality traits questionnaires, such as 16PF and neo-pi-r. Although some domestic scholars put forward the "big seven personality trait" structure model on the basis of the big five personality trait structure model, they believed that the "big seven personality trait structure" model was more suitable for describing the personality traits of some people. However, the structure theory emphasizes the praise and criticism of personality traits rather than the objective description, which is in great conflict and contradiction with the guiding ideology of "there is no difference between good and bad personality traits" first proposed by Allport. After the continuous test of later practice, it is found that the

big five personality trait structure describes individuals through five representative personality traits. The advantages of simplicity and practicality have injected new vitality into the research of personality traits, which has been widely recognized by scholars and has been rapidly popularized in the research of leadership, social psychology, organizational psychology and other related fields.

Influence of personality traits on Leadership

The "great man theory" in the field of leadership was once very popular. Some believers of the "great man theory" believe that some individuals are destined to become leaders because they are born with a series of personal characteristics destined to become excellent leaders. In the early 20th century, with the gradual deepening of research, the great man theory gradually developed to the trait theory and finally formed the trait theory. However, the early trait theory did not assume that the traits of leaders were inherited or acquired in the later stage, but only asserted that the personality traits of leaders were different from those of non leaders. Leadership trait theory assumes that individuals who can become leaders have distinctive personality traits. Many researchers point out that personality traits are of great significance in distinguishing excellent leaders from ordinary people.

Modern leadership trait theory successfully reveals the close relationship between personality traits and outstanding leaders. For example, some scholars also found a series of personality traits closely related to leadership and leadership effectiveness through research.

Psychologist Stogdill found some particularly interesting phenomena after analyzing, sorting out and studying the research literature over the years twice in 1948 and 1974. In 1948, in his first study, he analyzed 124 trait research results from 1904 to 1974 and found that there were differences between leaders and non leaders in eight aspects: responsibility, intelligence, initiative, perseverance, self-confidence, social, alertness and insight. In addition to intelligence and insight, the other six traits were personality traits. In 1974, Stogdill's second study mainly observed multiple personality traits that were positively correlated with leadership from another perspective. The study found that a successful leader usually has the following 10 characteristics: energetic and persistent, adventurous and pioneering spirit, self-confidence and keen ability to know people, driven by a strong sense of responsibility and desire to complete work, able to take the initiative to open up the

work situation in social activities, willing to be responsible for organizational decisions and behavioral consequences, willing to bear work pressure, and able to withstand setbacks and failures, Have strong influence on others, and be able to establish a good social interaction mechanism to achieve the established development goals of the organization. Northouse (2013) pointed out through research that the traits corresponding to these 10 characteristics can be simply summarized as: achievement, tenacity, initiative, self-confidence, social ability, insight, responsibility, tolerance Influence and cooperativity. Most of these traits are consistent with Stogdier's first research conclusion, which well verifies Northouse's first research results, but also finds some new skills and traits. Northouse's research found that in addition to influence and insight, other traits also belong to the category of personality traits.

Similar to Stogdier, Mann (1959) made a comprehensive analysis of up to 1400 research results on personality traits and leadership, and found that personality traits can distinguish leaders from non leaders. Leaders are extraversion, intelligence, masculinity, dominance, and leadership Six personality traits such as adjustment and conservatism are better than non leaders. Lord (1986) and others used a more accurate meta-analysis method to re analyze Mann's research, and found that intelligence, dominance and masculinity were significantly related to individual recognition and follow of leaders, and personality traits could significantly distinguish excellent leaders from ordinary individuals in different situations.

Kirkpatrick and Locke (1991) used qualitative research to sort out the early research results of personality traits and found that excellent leaders are usually different from non leaders in six personality traits, which are confidence, integrity, motivation, drive, and Task knowledge and cognitive ability. Kirkpatrick and Locke believe that these personality traits may be innate or acquired through postnatal efforts. However, these six personality traits are the key conditions for becoming an excellent leader. Bass (1990), based on the research results of Stogdill and others, comprehensively combed, analyzed and studied the literature and research results of personality traits around the world before the end of the 1990s, and finally summarized 10 personality traits that have a significant impact on Leadership: emotional balance control, innovation, creativity, creativity, creativity, creativity, creativity, and creativity Aggressiveness, alertness, adjustment, independence,

integrity, self-confidence, adaptability and adjustment. House and Aditya (1997) pointed out after summarizing and analyzing the relevant research results of leadership traits that traits such as self-confidence, intelligence, achievement motivation, adjustment, physical energy and prosocial influence motivation can consistently distinguish leaders from the crowd.

For the evaluation of leadership, the evaluation center is considered to be the most effective method. Fang Hua (2015) pointed out that longitudinal research on the measurement results of the evaluation center is the most effective means to identify and study leadership traits. Howard and Bray (1988) repeatedly compared and studied the evaluation results and position promotion of at&t leader evaluation center and found that some unique personality traits can accurately predict the level of leadership an individual can achieve in 20 years. These personality traits include cognitive skills, management skills, desire for promotion, interpersonal skills and control expectations; And some other specific personality traits are more effective in predicting the level of a leader's promotion after 20 years than the level of a leader's promotion after 8 years. These specific personality traits include self-confidence, energy, motivation and the need for basic safety (negative correlation). Yukl (2010) summed up nine personality traits that are most closely related to the leadership effectiveness of leaders in large and medium-sized enterprises. These traits include self-confidence, personal integrity, emotional maturity, internal locus of control orientation, low need for affiliation, moderately high achievement orientation High energy level and stress tolerance and socialized power motivation

Leadership style theory

Clarifying the connotation of "leadership" is the logical starting point for further research on "leadership style". If you want to have a more in-depth understanding of leadership style, you first need to comb and examine the development process of leadership theory.

Development history of leadership style theory

Tracing the development of leadership theory at home and abroad, it can be roughly divided into the following four key stages:

The leadership trait theory stage (train approach).

The basic assumption of the theory is that there are certain personality traits that can more effectively carry out different types of leadership activities. If a leader

has these personality traits, he / she can effectively improve his / her leadership level and leadership effectiveness, so that his / her leadership activities can achieve twice the result with half the effort;

Leadership style and leadership behavior theory stage (style/behavioral approach). The theory was born in the 1940s. The research mainly tends to practical application, emphasizing the practical application effect of leadership effectiveness, and believing that leadership effectiveness is closely related to how leaders act. This view has greatly broadened the research scope of leadership theory. But at the same time, it also brought about a big defect, that is, the argument failed to give which leadership style and leadership behavior had the most leadership, which promoted the birth of contingency leadership theory;

Contingency approach. The theory was born in the United States in the 1960s, and the research mainly tends to the contingency orientation. The theory emphasizes the influence of leadership situation on leadership effectiveness, and believes that in the process of research, we should organically combine the leader's personality traits, organizational operating environment and leadership level in order to better understand leadership.

New leadership approach. The theory was born in the 1990s, and the research tends to the new leadership orientation. The theory emphasizes the idea of people-oriented leadership, pays attention to the shaping and training of leadership organizational planning ability and change ability, and places humanized management at the core of leadership. At present, the theory of leadership style, as the core research content of the new leadership theory, has been paid attention by more and more experts and scholars at home and abroad. With the further development of theoretical research, some scholars have gradually shifted their research focus from the perspective of personality traits to the study of leadership style. After decades of accumulation and precipitation, this field has achieved fruitful research results.

Connotation of leadership style

The essential meaning of the word "style" is that it has behaviors and concepts such as performance, image and handling characteristics that are unique to others, and it also refers to the external manifestation of an individual's leadership or the individual characteristics presented by a certain artistic work. For the

interpretation of leadership style, different scholars have made corresponding elaboration. For example, Liz and Gupta (Li Z, Gupta, 2001) pointed out that leadership style is the behavior of leaders to their subordinates in order to achieve management goals. McColl Kennedy and Anderson (2002) pointed out that leadership style is the behavioral characteristics of leaders' habitual leadership style, which is a more habitual behavior mode of a leader. Here, the so-called habitual leadership style refers to the habit of leaders gradually solidified in the long-term leadership practice and personal experience, and consciously or unconsciously plays a corresponding stable role in the process of leadership, so the habitual leadership style has a very strong personalized color. Chenwenzong (2006) believes that leadership style is the demeanor and style of a leader, and the normal and habitual development of his leadership behavior. Zhaoguoqiang and wangjinchao (2008) pointed out that leadership style is essentially a relatively fixed behavior style of leaders, which is generally characterized by distinct personal characteristics and is influenced by factors such as leaders' personality traits and leaders' personal experience. Yudehua, lijiangang and xujiani (2012) pointed out that leadership style is a process in which leaders pursue a higher level of leadership as the goal, take leadership behavior as the basic form of expression, make full use of the basic carrier of leadership activities, and influence their subordinates through a series of personalized and plastic behavior. Yang Fu et al. (2012) defined leadership style as the behavior that the superior often adopts to enable the subordinate to achieve specific expected results. Chenxiaoping (2018) took corporate mentors as the research object and believed that leadership style is a behavior mode with distinctive personal characteristics formed by corporate mentors in the long-term management practice. It can be seen that scholars at home and abroad have a unified definition of leadership style, and most of them believe that leadership style is a relatively fixed behavior with personal characteristics adopted by leaders in order to achieve organizational management goals.

Classification of leadership styles

There are many classification methods of leadership styles. Different scholars have summarized and divided leadership styles according to their research perspectives

The famous psychologist Lewin and his collaborators have started to explore the theory of leadership style since the 1930s. Lewin et al. Found that in the process of specific leadership practice, leaders usually consciously or unconsciously choose different types of leadership styles to play their leadership roles. The effective application of these leadership styles will have different effects on the leadership performance and the work performance of organization members. According to the different mechanisms and functions, Lewin and others divided the leadership style into three types: authoritarian leadership, Democratic leadership and laissez faire leadership.

Burns (1978) first divided leadership styles into two basic types: transformational leadership and transactional leadership. Burns further pointed out that transactional leadership style mainly emphasizes that leaders and employees can meet the needs of lower levels of leaders and employees through lower level "interest exchange". Transformational leadership emphasizes the leadership and change of leaders to employees, and realizes the long-term development of the organization and employees mainly by meeting the needs of employees at a higher level (self-worth, respect, etc.). Burns regards two different leadership styles as two opposite levels in a continuum, while Bass (1985) studies and analyzes the two as complementary structures, and believes that transformational leadership style is based on transactional leadership style, and the two should not be regarded as an exclusive relationship. Later, Bass and Burns (1993) divided transactional leadership style into two dimensions: exceptional management and contingent compensation. Based on the definition of Bass's transformational leadership, Chinese scholars Lichaoping and Shi Kan (2005) fully considered China's traditional cultural background and current national conditions, and divided the transformational leadership style into four dimensions: vision incentive, leadership charm, moral example and personalized care.

Daniel Goleman (2002) and (Hay/McKinsey) Hay/Meber Management Consulting Co., Ltd. randomly selected 3871 people from a database of nearly 20000 senior managers around the world as research samples to conduct leadership style research. Daniel Gorman has found six distinct leadership styles through research: authoritarian leadership, authoritative leadership, affinity leadership, Democratic leadership, pacesetter leadership and coaching leadership. Daniel Goleman further

pointed out that these six leadership styles are not absolutely good or bad, and the key is whether to apply the appropriate leadership style to deal with different people or things in the appropriate situation. Studies have shown that the richer the leadership style used by leaders, the higher the leadership performance of the organization. Effective use of four or more leadership styles, especially leaders who effectively use democratic, coaching, authoritative and affinity leadership styles, can better improve the organizational climate and achieve better performance. Of course, the most effective leaders can flexibly choose their own leadership style according to different opportunities and situations.

In addition, some scholars have proposed authentic leadership, abusive leadership, benevolent leadership, charismatic leadership and paternal leadership.

According to the above literature review, it is not difficult to find that different scholars have different ways of dividing leadership styles due to different research positions, perspectives and objectives. In other words, the current classification of leadership styles has not yet formed a unified standard and model. However, by comprehensively comparing different classification methods, we find that the classification methods of transformational leadership style and transactional leadership style of Burns and Bass have the most far-reaching influence, and the academic circles have the highest recognition and acceptance of them.

The impact of leadership style on leadership

Amabile (1983) pointed out that the study of leadership should not ignore the team level and cooperation level, and stressed that we should focus on the leadership at the team level. The impact of organizational leadership style on team leadership has become one of the hot topics in the current organizational theory research. Finkelstein (1997) believes that, in a sense, leadership style represents a leader's higher-level leadership ability and leadership level, which will take many forms according to the leader's values, ideas, experience, personality and experience. But no matter what form, leadership style will significantly affect the strategic choice and long-term development of the organization. Among a large number of leadership styles, transformational leadership style is considered to be one of the most promising leadership styles, which has received widespread attention from many experts and scholars. Some scholars' research shows that transformational leadership style is more effective than other types of leadership styles. Bass (1985) pointed out

that transformational leadership style can promote subordinates to produce higher work performance than expected. Whether subordinates work hard or not largely depends on their sense of mission, intrinsic motivation and commitment to the leadership. These internal factors make their work performance far beyond the standard requirements of normal work, thus forming higher work performance. In addition, the incentive behavior and charismatic behavior of leaders with transformational leadership style will not only significantly enhance the perceived self-worth and the importance of the work they are engaged in, but also effectively improve the organizational members' sense of identity and commitment to work tasks, so as to effectively improve the leadership and leadership effectiveness of leaders. Howell (1999) further found through research that transformational leadership style can have a positive impact on the innovative behavior of organizational members, which can determine that the innovative behavior of organizational members is one of the key predictive variables of leadership effectiveness. Enesly (2003) conducted a correlation study on leadership style and leadership performance of leaders and found that transformational leadership style can effectively improve the leadership performance of enterprise managers. Especially when studying the relationship between entrepreneurial orientation and corporate performance, Ernest found that if the dynamic role of the external environment is taken into account, the role of transformational leadership style and transactional leadership style is different. The main performance is that with the increase of the dynamic role of the external environment, the positive impact of transformational leadership style increases, while the positive impact of transactional leadership style decreases accordingly. Judge (2004) found that transformational leadership style has a significant positive effect on the leader's personal leadership performance and the management performance of the whole organization. Chenwenjing and Shikan (2007) found that transformational leadership style has a stronger predictive effect on leadership than transformational leadership style, transactional leadership style and paternalistic leadership style. Xuhong (2009) believes that the theoretical significance and practical application value of the research on transformational leadership style lies in that it can more accurately reflect the specific leadership activities of leaders and explain the subtle differences in the effectiveness of leadership. Yu Bo and liuxinmei (2009) pointed out that

transformational leadership style can significantly improve leadership and promote organizational innovation performance and creativity.

High-tech enterprises

High technology

The term "high technology" first appeared in the 1960s and was officially included in the "Supplement 9000 words to the Webster Third Edition New International Dictionary" published in the United States in 1983. Among them, high technology refers to the technology that uses or contains cutting-edge methods or instrument uses.

As for the meaning of high technology, different countries have different interpretations in different historical periods. Some scholars believe that "high technology" refers to modern technology whose basic principles and concepts are mainly based on the latest scientific achievements. It is a dynamic and innovative technology group at the forefront of science, technology and engineering. In recent years, most people have begun to think that "high technology refers to the technology based on the latest scientific and technological achievements, and is a new or cutting-edge technology that has a significant impact on the country's military, economic, etc., has great social significance or can form an industry". Obviously, high technology is a new technology, which is based on the latest scientific and technological achievements. On the contrary, new technology is not necessarily high technology. New technology is a new form of technology emerging in the process of social and economic development. It does not necessarily represent the latest cutting-edge technology. High-tech is generally called High-Tech in foreign countries, but it can be divided into narrow sense and broad sense in China. High-tech in the narrow sense is the concept of high-tech with international comparability, while high-tech in the broad sense includes "high-tech" and "new technology". This is mainly caused by the historical reasons of China's economic development, because China's economy is in a process of simultaneous industrialization and modernization. We hope to introduce more new technologies while introducing more high technologies, seize the historical opportunity that many new technologies have just emerged and the gap with developed countries is not very large, catch up, and narrow the gap in science, technology and economy with

developed countries as soon as possible. In view of this, China has extended high technology to high and new technology. High-tech in this paper refers to the broad concept of high-tech, which is the combination of high-tech and new technology.

Meaning of high-tech enterprises

Since the late 1970s, high-tech represented by microelectronics has developed rapidly. New scientific and technological revolutions have sprung up in the United States, Japan, Western Europe and other developed countries, and then expanded to other countries and regions in the world. Especially after entering the 1990s, high and new technologies in all fields have made great progress, and have achieved commercialization and industrialization at an unprecedented speed.

However, different understanding of what is high-tech has led to different understanding of high-tech enterprises. At present, there are the following definitions of high-tech enterprises:

A. High-tech enterprises are enterprises that have full penetration and function of high-tech in enterprise value activities (i.e., various activities carried out by enterprises to successfully transform various resources into outputs). This view holds that judging whether an enterprise is a high-tech enterprise cannot only depend on whether it transforms high-tech into real productivity, which is mainly reflected in products, that is to say, whether the enterprise's products are high-tech products.

B. Scientific American magazine defines high-tech enterprises as enterprises that need continuous high-level innovation, and their market may change overnight; Half of such enterprises need more than 10% of engineers and scientists, while enterprises engaged in the most marginal technology need more than 15% of senior engineers and scientists.

C. According to the view of American scholars F.GDood and H.B. Muntser, high-tech enterprises can be defined as a kind of production technology companies that reflect high growth rate, high research and development costs, high value-added, strong export-oriented and labor-intensive.

Based on this, the definition of high-tech enterprises is: high-tech enterprises should refer to those enterprises that develop, produce and sell high-tech products or use high-tech on a large scale. Their essential characteristics, which are different from those of ordinary enterprises, are that they are involved in the process of

providing products or services to the society with high technological content based on emerging scientific knowledge.

Definition of high-tech enterprises

The formation and development of high-tech enterprises is the inevitable result of the sustainable development of high-tech. High and new technology itself is a dynamic development process, with different meanings in different periods. In addition, people's social background and theoretical framework are different, so their understanding of high and new technology enterprises is also different, resulting in the following criteria for defining high and new technology enterprises.

a. The definition standard of the United States mainly adopts two indicators: research and development intensity, that is, the proportion of product research and development costs in total output; The proportion of scientific and technological personnel (including scientists, engineers and skilled workers) in the total labor force.

b. Japan defines high-tech enterprises mainly from the aspects of saving resources and energy, high technology intensity, rapid technological innovation, having a certain market scale in the future and having a huge impact on related industries.

c. The Organization for Economic Cooperation and Development (OECD) regards R&D intensity as the standard for defining high-tech industries, and divides six industries with higher R&D intensity compared with other manufacturing industries into high-tech industries: aerospace manufacturing, office and computer equipment manufacturing, communication equipment manufacturing, pharmaceutical manufacturing, scientific instrument manufacturing, and electrical equipment manufacturing.

d. In March 1991, China's former National Science and Technology Commission issued the Conditions and Measures for the Identification of High-tech Enterprises in the National High-tech Industrial Development Zone (hereinafter referred to as the "Measures"), which established the following criteria for the identification of high-tech enterprises: 1 enterprises are knowledge-intensive and technology-intensive economic entities; 2 Scientific and technological personnel with college degree or above account for more than 30% of the total number of employees of the enterprise; The scientific and technological personnel engaged in the research and development of high-tech products shall account for 10% of the

total number of employees of the enterprise; For labor-intensive high-tech enterprises engaged in the production or service of high-tech products, scientific and technological personnel with college degree or above account for more than 20% of the total number of employees; 3 The expenses for research and development of high-tech products account for more than 3% of the total income; 4 The funds used for research and development of high-tech and its products account for more than 3% of the enterprise's annual income; The total income of high-tech enterprises generally consists of technical income, output value of high-tech products, output value of general technology products and technology-related trade. The sum of the technical income and the output value of high-tech products of high-tech enterprises should account for more than 50% of the total income of the enterprise in the current year.

Characteristics of high-tech enterprises

High-tech enterprises are knowledge-intensive, technology-intensive and talent-intensive enterprises with the pursuit of innovation as the core business content. Compared with traditional enterprises, high-tech enterprises have the following characteristics:

High-tech enterprises are knowledge-intensive enterprises. Traditional enterprise technology needs a lot of capital and equipment, and tangible assets play a decisive role, while high-tech enterprises are knowledge and skills, and the investment of intangible assets plays a decisive role, and having a high-level R&D team is their greatest wealth.

High-tech enterprises take the innovation of science and technology as their core competitiveness. Usually, the development and innovation of technology precedes the needs of customers. The competition between high-tech enterprises is not reflected in the possession of the original market share, but mainly in the development of new markets, seizing and rapidly entering the market.

High-tech R&D investment is high and high-risk. High-tech research has great uncertainty, and the failure rate of technological development research is greater than the success rate; In addition, the technology development and upgrading are fast, the technology life cycle is short, and the technology that has spent a lot of energy and money can be replaced by the updated technology soon, so high-tech enterprises have high-tech risks; When developing and researching new technologies

and new products, technical personnel often cannot grasp the needs of consumers well, which makes the products can be recognized by the market at a low level after being developed. Therefore, high-tech enterprises have high market risks.

High-tech enterprises have high growth and high competitiveness. Once a product or service is successful in the market, due to factors such as technical know-how, technology leadership, intellectual property protection, franchise, etc., it will enable the enterprise to obtain a temporary market monopoly position, with high product added value, and the enterprise can obtain an extraordinary growth rate. However, driven by the competitive consciousness of "the leader should lead more", "the laggard should not be left behind" and the high profit, in the past, a high-tech manufacturer could only launch a new product in three years, and now it may launch several new products in one year.

Due to the high concentration of knowledge in high-tech enterprises and the relatively high degree of risk, the management of high-tech enterprises is more complex than that of ordinary enterprises. When we build the evaluation model of middle-level managers in high-tech enterprises, we must effectively build it according to the characteristics of high-tech enterprises, so as to ensure that the evaluation model of leadership truly meets the needs of the development of high-tech enterprises in China.

Types of high-tech enterprises

High-tech enterprises vary widely, and people often classify them into different types according to certain standards according to their understanding of the nature of high-tech enterprises. This paper attempts to divide it according to the specific embodiment of high-tech enterprises in the production and operation process. According to the above analysis, high-tech enterprises can be divided into three types: product-oriented high-tech enterprises, technology-improved high-tech enterprises and service-oriented high-tech enterprises:

Product development high-tech enterprises

It refers to enterprises that mainly develop, produce and sell high-tech products. This type of enterprise may adopt traditional production processes like ordinary enterprises, but unlike ordinary enterprises, the products it produces are knowledge-intensive products. Like scientific research institutions, it pays attention to the research and development of products, but the purpose of its research and

development is not to sell technology, but to produce and sell itself. For example, PKU Founder Group, relying on its strong technical strength and talent team, has continuously launched new products with independent intellectual property rights.

Process improvement high-tech enterprises

It refers to enterprises that use a large number of high-tech equipment or high-tech processes to produce products. It is different from the production-oriented enterprises in that the focus of technological research and development of such enterprises is on the production process, focusing on the use of high-tech equipment or research and development of high-tech processes, rather than necessarily producing or selling high-tech products. It may also use high-tech products to produce general products.

Service-oriented high-tech enterprises

It refers to enterprises that provide certain services to the society and use a large number of high-tech in their service projects. Such as management consulting enterprises, information service enterprises, etc. In production-oriented enterprises, high-tech is reflected in the results (products), the high-tech of application-oriented enterprises is reflected in the production process, and the high-tech of service-oriented enterprises is mainly reflected in the consumption (service) process. For most high-tech enterprises, high-tech is not only reflected in the production process, but also in products or services.

Theory of sustainable development

The emergence of the concept of sustainable development of enterprises

The sustainable development of enterprises was put forward at the 1984 World Conference on Environmental Management Industry. At the meeting, representatives of all participants agreed that the root cause of the increasingly serious global environmental problems is the enterprises of all countries; The business community must recognize that pollution is not only a waste, but also a inefficient phenomenon of production; At the same time, enterprises are also an important force to solve environmental problems. Environmental protection is an objective requirement for the sustainable development of human society. Therefore, in order to achieve the sustainable development of enterprises, enterprises must give up the uncivilized production mode that endangers the survival and

development of enterprises, establish a good corporate image through creative environmental management, win the recognition of the society, gain comparative advantages over competitors, and make the enterprise develop in the increasingly competitive market for a long time. At the same time, a series of relevant agreements and regulations have been issued, such as the Montreal Protocol (1987), the Rio Declaration on Environment and Development (1992), the Review Rules for Voluntary Participation of Industrial Enterprises in Ecological Management (1993), and the Trade and Environment Resolution (1994). These agreements and regulations force modern enterprises to implement sustainable development strategies from different aspects.

Enterprise sustainable development concept

The sustainable development of enterprises means that in order to seek sustainable development, enterprises should strive to implement production methods and measures that can not only meet the needs of consumers, but also reasonably use natural resources and energy, and protect the environment. By pursuing comprehensive benefits (the unity of economic, social and environmental benefits), enterprises should achieve harmonious coexistence between themselves and society, competitors and consumers.

The connotation of this view mainly includes the following aspects:

Enterprises should change from the traditional pursuit of economic growth to the pursuit of economic development;

The development mode of the enterprise should be changed from "cowboy type" to "spaceship type (orbital type)";

The utilization of resources and energy by enterprises should be transformed from consumption to conservation;

Enterprises should change their pollution control from end control to full process control;

The competitive advantage of enterprises should be transformed from the four elements (quality, price, service and timeliness) to the five elements (quality, price, service, timeliness and environmental protection);

The enterprise management system should change from pursuing a single ISO9000 system to pursuing an ISO14000 system at the same time.

Enterprises are the main body of the market economy. Under the condition that the economic development mode implements sustainable development, enterprises must consider implementing sustainable development in their business philosophy and marketing decisions.

The concept of sustainable development leadership

In the context of increasingly serious environmental problems in globalization, corporate social responsibility has gradually attracted widespread attention from academia and industry. Some scholars pointed out that corporate social responsibility represents the responsibility of enterprises to "people, planets, profits" and other stakeholders (Cramer, 2006). On this basis, triggering or shaping the leadership type of corporate social responsibility has become an important research topic. For example, Fullan (2005) believes that leadership is the "lever" of sustainable development and the key factor to leverage the sustainable development strength of an organization. Therefore, it is necessary to pay attention to the role of leadership. Peterlin and Dimovski (2015) proposed that sustainable development of organizations requires sustainable development leadership, and believed that sustainable development leadership takes into account the needs of a wider range of stakeholders, including future generations and the natural environment. Dalati et al. (2017) also believed that the concept of sustainable leadership strategy is related to the development of organizational capacity, which helps to create better value for stakeholders. And sustainable leadership involves ethical, social and responsible business aspects, value orientation of stakeholders, corporate responsibility, etc.

The Brundtland Commission first focused on the sustainability of human development. In its report on sustainable development, it defined sustainable leadership as "meeting the needs of contemporary people without compromising the ability of future generations to meet their needs" (WCED 1987). The Institute of Sustainable Leadership (2015) defined sustainable leadership in the business environment as behaviors, practices and systems that create lasting value for all stakeholders of the organization, including investors, the environment, other species, future generations and communities (Edgeequilibrium, 2015). Its connotation can be reflected in four levels: (1) personal level: maintaining personal mental and physical health; (2) At the organizational level: maintain a work environment that allows employees to develop multiple intelligences to achieve the goals of the

organization, which is consistent with the goals of stakeholders (3) At the social level: assume social responsibility in community activities. (4) At the ecological level: achieve environmental sustainability (Casserley and Critchley, 2010). Suriyankietkaew and Avery (2016) pointed out that sustainable leadership integrates leadership and management practices and values, such as competitive and proactive employee and team orientation, trust, strategic planning, vision, moral behavior, financial independence, environmental and social responsibility, moral behavior, culture, and knowledge management, such as knowledge sharing, innovation, quality, etc. It can be seen that sustainable development leadership emphasizes the creation of current and future profits for the organization and the continuous efforts to improve the ecological environment (McCann and Holt, 2010). It is a leadership style with "balance" characteristics between the current and future, profit and responsibility, and enterprise and society. It is also a leadership style that emphasizes the balanced development of human, profit and planet based on the perspective of Triple bottom line (TBL), It plays an important role in the triple development goals of "society, economy and environment" of enterprises (Peterlin et al., 2015).

Chief technology officer

The rudiment of chief technology officer originated in the United States in the 1950s and 1960s. Many large companies set up luxury laboratories far away from the company's headquarters and production sites, gathering many excellent scientists to conduct scientific research in a commercial atmosphere. The person in charge of the laboratory is usually the vice chairman of the company, whose main responsibilities are to absorb excellent scientists, discover new ideas and publish research results, but is not allowed to participate in the company's strategy and decision-making process. In the 1980s, science and technology were unpredictable. Some technology research and development companies, such as General Electric, AT&T and ALCOA, urgently needed to translate scientific research achievements into practical benefits. At this time, the concept of chief technology officer came into being in the United States. At the beginning, the company mostly appointed the person in charge of research and development institutions as the chief technology officer. Practice has proved that this choice is not scientific. The chief technology officer needs a technician or scientist who has the ability to transform technology

into business strategic decision-making. Lewis also expressed a similar view: the chief technology officer is not the person in charge of the laboratory who is transformed into a civilian, but a technical business person who can deeply participate in the overall strategy of the company. Today, the position of chief technology officer has spread to all major enterprises around the world, performing tasks related to technology strategic management. Many high-tech enterprises in China have also set up the position of chief technology officer. The positioning of the chief technology officer at home and abroad is slightly different. The United States believes that the responsibilities of the chief technology officer need forward-looking strategic thinking, focusing on the technical development direction of products and services, and less involved in project management matters. In China, the chief technology officer prefers R&D management, and the overall level is slightly lower than that of the United States. Its main responsibilities are to lead the technical team to develop various products, guide technical updates, manage and develop relevant resources, and ensure the timely completion of project delivery. There are also some functions similar to that of architects or chief engineers. As the authority on the technology side, they prepare for the company's future development direction, and provide constructive advice to the chief executive officer (CEO) to help them make decisions. This paper defines the chief technology officer as the vice president in charge of technology, the president of the Enterprise Research Institute, the director of research and development, the senior engineer and the chief engineer. Its work is responsible to the Chief Executive Officer (CEO).

Record of chief technical officer of Guangxi science and technology enterprises

As an underdeveloped region, Guangxi has a weak sense of innovation and low investment in research and development, which leads to weak industrial innovation ability and core competitiveness. In order to solve the problem of inactive enterprise innovation and the lack of high-level scientific and technological innovation leading management talents, in 2020, the Guangxi Zhuang Autonomous Region Science and Technology Department launched the exploration work of promoting the establishment of the chief technical officer of scientific and technological enterprises and the filing work of the chief technical officer of scientific

and technological enterprises. By the end of 2022, 857 enterprises had registered as chief technical officers.

Delphi Study

Delphi Study is a structured decision support technology. Its purpose is to obtain relatively objective information, opinions and opinions through independent and repeated subjective judgments of multiple experts in the process of information collection.

The investigation team conducted multiple rounds of consultation on the selected expert group anonymously. The investigation team summarized and sorted out the expert opinions of each round, and sent the sorted materials to each expert for analysis and judgment. The experts put forward new argumentation opinions on the basis of the sorted materials. After repeated so many times, the opinions gradually became consistent, and a more consistent and reliable conclusion or scheme was obtained.

The main point of the Delphi method is that the experts who are asked for opinions use anonymity to express their opinions. Experts cannot discuss with each other and do not have horizontal contact. So as to avoid the convergence of expert opinions to a few influential experts.

21st Century Skills

Today's 21st century society and work sphere require individuals to have 21st century skills—communication, innovation, adaptability, and higher order thinking skills (Alejandra Velez 2012). The P21 framework focuses on ensuring that students have a solid foundation of the core subjects where students are able to apply the knowledge to real-life scenarios. Students also have to have life, career, learning and innovation skills, and media and technology literacy. Furthermore, this framework states that 21st century students should have global awareness; financial, economic, business and entrepreneurial literacy; and civic, health and environmental literacy (Alejandra Velez 2012).

The qualifications to be an executive for the sustainable

Relevant studies have revealed to us that most of the existing Sustainable Leadership is elaborated from the personal characteristics and existing job

responsibilities of managers. Although these factors can also measure the leadership level of managers by revealing some deep-seated connotations of managers, such as motivation, personality, social role, self-image, etc., this measurement is actually one-sided and uncertain, Because it gives up the examination of the leader's environment. The actual situation is subject to the dual constraints of job requirements and environment. Different leaders will show different sustainable leadership after taking office.

Based on this, this paper considers the relevant theories about the construction of Sustainable Leadership evaluation model in the relevant literature at home and abroad, and mainly studies the interactive relationship between "leader - Leadership situation - led".

Characteristics of high tech enterprise managers

On the basis of referring to various literature achievements at home and abroad, according to the research conclusion of the research group of "scientific and technological leadership" of the Chinese Academy of Sciences, and the analysis of the role and role of high-tech enterprise managers, this paper divides the 18 characteristics of high-tech enterprise leaders summarized in previous literature into charisma, foresight, influence Control force [. Charisma is that a leader of an enterprise needs to set an example and reflect his unique role as a leader in action. Foresight is essentially an ability to focus on the future, predict the future and grasp the future. In this paper, foresight is mainly reflected in the ability of managers to grasp the market dynamics and participate in the formulation of the company's strategy to ensure the implementation of the strategy; influence is the ability of managers to actively influence their subordinates; control It is the ability of the manager to strengthen the internal management of the Department and achieve the company's goals. Classification of leadership characteristics of managers.

Table 2.1 Leadership characteristics of managers in new technology enterprises

Item	Charisma	Foresight	Impact	Control force
Specific items	Integrity	Development and innovation capability	Social skills	Set the department's operational objectives
	Passion and dedication	Strategic analysis and judgment ability	Maintain crisis awareness	Ability to formulate operation plan
	Take responsibility volatility	Ability to unify strategic objectives	Knowledge sharing capability	Ability to provision resources
	Good at learning	Commercially sensitive	Authorization, trust building	Improve process and strengthen work specification
	Purpose excellence			
	Self confidence			

Integrity: be able to act in compliance with words when exercising power and performing obligations; Always here to the principle of integrity when personal interests and company interests are threatened or lured

Passage and decision: less of disputes, brave to try, and influence the team to form an atmosphere of passage and decision

Take responsibility actively: maintain your beliefs, accept challenges from others, admit misses and change your behavior when necessary

Be good at learning: be able to recognize your own shortcuts, increase knowledge and improve skills by learning from your own or others' experiences and

scientific research achievements, so as to observe the core competitiveness conducted to future development

Purpose excellence: not satisfied with the status quo, have a strong desire for success, always set higher goals, ask yourself to overcome obstacles and complete more challenging tasks

Self-confidence: a person shows obvious passion and commitment to his fantasy

Leadership and innovative ability: be free from the shackles of stereotypes and past experience, have the risk to break through stereotypes, consistently improve work and learning methods, so as to adapt to the requirements of new concepts and new situation development, and data to put them into practice

Strategic analysis and judgment ability: be able to consider a variety of risks, judge and weight risks, and determine the focus and direction

The ability to unify strategic objectives: to ensure the implementation of the organization's strategy and the achievement of strategic objectives through continuous and correct decisions and plans

Business sensitivity: understand the impact of the external environment on the business of the Department, and be able to sensitively capture potential business opportunities

Social skills: be good at communication and exchange needed goods in work; In communication, the attitude is sincere, the behavior is natural, not artificial, not positioning; Be easy going and genetic with others, and inspect others

Maintain crisis awareness: as a leader of an enterprise, he should be good at dealing with problems and conflicts in variable environments and effectively resolve the crisis

Knowledge sharing ability: summarize experience and lessons, lead the team to seek better methods and models, and actively promote new initiatives and practices

Authorization and trust building: be able to assign power to subjects to complete projects or tasks according to department characteristics and business needs

Set the department's operational objectives: set specific operational objectives for the department or team according to the company's strategy

Ability to formulate operation plan: formulate the work plan of the service department and use the plan to promote the completion of the goal

Ability to allocate resources: allocate resources to improve the return on investment of resources

Improve the process and strengthen the work specification: timely improve the company's process, strengthen the work specification, and promote the implementation of the company's guidelines and policies

High tech enterprise culture

In recent years, experts and scholars at home and abroad have found that there is a great correlation between the culture of an enterprise and the leadership style of its leaders through empirical research. The leadership style of enterprise leaders depends in large part on the acceptance of leadership by corporate culture. Therefore, this paper discusses the impact of the organizational culture of high-tech enterprises on the leadership of middle-level managers. The cultural characteristics of high-tech enterprises mainly include:

Share common values

Peters and Waterman, the authors of the book "the pursuit of excellence", came to the conclusion after inspecting 62 high-tech enterprises in the United States, such as IBM, Intel, Hewlett Packard, and so on: each of them has values that everyone abides by.

People oriented

High tech enterprises are knowledge, technology and talent intensive enterprises. In the company management concept, we must adhere to the idea of "people-oriented". Neusoft group emphasizes: people-oriented, pursue the common development of individual and society, provide a stage for employees to realize their own value, and create the value of the enterprise and society through the realization of employees' personal value.

Encourage development and innovation

One of the characteristics of high-tech enterprises is high investment and high-risk enterprises. Therefore, high-tech enterprises have a strong spirit of innovation, change and competition, dare to create and introduce new methods, and constantly invent new products.

Pay attention to the integration of multiple cultures

High tech enterprises engaged in the R & D and manufacturing of new products or new technologies are facing fierce international competition. Therefore, high-tech enterprises pay attention to absorbing advanced management technology, while dealing with the problems caused by the differences between different regions and cultures of different countries, so as to realize the integration of enterprise culture.

Based on the above analysis, high-tech enterprises are more oriented by the development of culture in the construction of enterprise culture. According to the empirical research on enterprise culture and leadership style by Chen Weizheng, Xin Rong and others, the more effective leadership style in high-tech enterprises is transformational leadership. In the analysis of factors affecting the leadership of middle-level managers in high-tech enterprises, we need to consider the organizational culture of high-tech enterprises, The factors are shown in table 2.2.

Table 2.2 Culture based leadership factors of middle managers

Index	Cultural management ability	
Specific indicators	Focus on cultural diversity	Promote corporate culture
	Cross cultural management	Absorb and learn from other cultural capabilities
	Respect cultural differences	

Focus on cultural diversity: critically absorb talks with multiple backgrounds, capabilities and experiences, and provide support for their career development

Cross cultural management: be able to consider and respect the specificity of different cultures, and creatively and flexibly solve the problems accounted in cross cultural work

Respect cultural differences: help others understand the value of different ways of thinking, views and work styles to the team

Propagandize the company's culture: actively propagandize the company's corporate culture and values, and take decisive corrective measures against acts that violate the core values

Absorb and learn from other cultural capabilities: be able to actively absorb and learn from the excellent culture of other relevant enterprises, and publicize and practice in this department

Organizational structure of high tech Enterprises

Contingency theory school believes that leaders' exercise of leadership must be carried out under certain conditions, and there is no leadership style and leadership style that can be applied to all situations. Therefore, the characteristics of the organizational structure of high-tech enterprises should be considered when constructing the leadership evaluation index system of middle-level managers in high-tech enterprises.

The characteristics of the organizational structure of high-tech enterprises include the following aspects:

Vertical and horizontal cooperation and flattening of hierarchical structure.

The work content is developing in the direction of rotation system, expansion, enrichment and flexibility.

Organizational rules are flexible, with less direct supervision, and employees implement self-management.

here are a lot of informal communication channels, constantly adjusting their responsibilities.

In high-tech enterprises, the tasks of work are mostly in the form of projects, which has the characteristics of high flexibility and mobility. This inevitably requires that the organizational structure unit should be flat, which corresponds to the flat structure. In the form of organization, it is mainly projecting team, work team, etc. These forms are formed according to the integration of team members' talents, specialties, hobbies and skills, so they can handle and solve emerging problems in a cooperative spirit.

In high-tech enterprises, through changes in organizational structure and management such as teams and project teams, the restrictions and repression of the

system on workers have been alleviated, and the work content has developed in the direction of rotation, expansion, enrichment and flexibility. These changes are aimed at mobilizing the enthusiasm and interest of employees, protecting individual personality and characteristics, and giving full play to the enthusiasm and creativity of employees.

Therefore, for middle-level managers of high-tech enterprises, effective leadership needs to focus on team cooperation and constantly improve the cohesion and combat effectiveness of the team. The factors that need to be included in the leadership of middle-level managers based on the organizational structure characteristics of high-tech enterprises are shown in table 2.3.

Table 2.3 Leadership factors of middle-level managers based on the organizational structure of high-tech enterprises

index	Team building ability	
Specific indicators	Form a consensus of collaboration within the team	Promote mutual trust between teams
	Establish inter team collaboration mechanism	Optimize staffing capacity

Form a consult on cooperation within the team: promote information sharing and cooperation inside and outside the team, clarify the purpose and significance of cooperation, and carefully form a joint force within the team

Establish the inter team cooperation mechanism: clarify the process interface and communication mechanism of the cooperation parties to ensure the smooth completion of the project

Promote mutual trust among teams: guide all parties to correctly face the setbacks funded in cooperation and solve them implicitly

Optimize personal allocation ability: be able to divide labor according to the personal characteristics and professional expertise of subordinates, so that team members can give full play to their perspective strengths

High tech enterprise personnel

Due to the particularity of the industry in which high-tech enterprises are located, the personnel of high-tech enterprises have different characteristics from those of traditional enterprises

Have corresponding professional expertise and high personal quality. Most of the staff in high-tech enterprises have received systematic professional education, mastered certain professional knowledge and skills, and have high personal quality. However, the staff in high-tech enterprises are mostly experts in one aspect, so they are not very familiar with other businesses.

Have a strong desire to realize self-worth. High tech enterprise personnel usually have a high level of demand and pay attention to the realization of their own value.

Attach importance to achievement motivation and spiritual motivation. A large number of empirical studies show that in the incentive structure of high-tech enterprises, the effect of achievement incentive and spiritual incentive is far greater than that of material incentive such as money.

Have a high degree of autonomy and creativity. Most employees of high-tech enterprises are engaged in creative work, relying on professional knowledge and constantly forming new knowledge achievements. Therefore, employees of high-tech enterprises tend to have a relaxed and highly autonomous working environment, and pay attention to self-guidance and self-management in work.

Table 2.4 leadership factors of middle managers based on subordinate characteristics

index	Pay attention to the development ability of subordinates	Scientific research ability
Specific indicators	Building organizational capacity	Ability to access information
	Ability to motivate and coach employees	Reasoning innovation ability
	Develop the ability of reserve personnel	Project risk identification and control capability
		Scientific research decision making ability
		Test observation ability

Build organizational capacity: plan personal needs according to business objectives, assess capacity gaps, and formulate and implement team building and employee capacity development plans

Motivate and coach employees' ability: understand the career development direction of subordinates, pay attention to their potential and plasticity, and carefully help them grow

Cultivate the ability of reserve personality: understand and inspect the reserve personality, create a relaxed learning atmosphere, and create opportunities for them to show their ability

Ability to acquire information: the ability to acquire relevant knowledge in this field, especially the frontier knowledge related to the development direction of this field through a variety of channels

Reasoning innovation ability: the ability to understand and reason about a thing by breaking it down into partial parts or describing its internal relationship through layers of causality, so as to innovate on the basis of the thing

Project risk identification and control ability: be able to find the risks of the project and take measures to control the risks

Scientific research decision making ability: be able to grasp the project from a macro perspective and decide whether the project is feasible according to the information

Test observation ability: focus on the operation of the project, and be able to observe the mobility of the project operation keenly

Related Research

1. Technical expertise and vision

Northouse (2021) provides a comprehensive overview of various leadership theories and practices, emphasizing the importance of technical expertise and vision in effective leadership roles. Zhang (2018) explores the relationship between chief technology officer shareholding and corporate innovation performance, highlighting the critical role of technical expertise and vision in driving innovation and strategic initiatives. Bi (2023). examines the current development status and challenges faced by high-tech enterprises in Guangxi, underlining the necessity of technical expertise and vision in overcoming these challenges and driving growth. Gartner (2023) report on strategic technology trends provides insights into the critical technical skills and visionary leadership required to navigate and leverage emerging technologies effectively. Kane (2021) discusses the role of leaders, particularly chief technology officers, in guiding their organizations through technological transformations, emphasizing the importance of possessing technical expertise and a clear vision for the future. McKinsey & Company (2022) outlines the diverse roles chief technology officers are expected to play, including as technologists and visionaries, highlighting the importance of deep technical knowledge and strategic foresight.

2. Business acumen and strategic thinking

Northouse (2021) discusses various aspects of leadership, including the significance of business acumen and strategic thinking in effective leadership practices. Kane (2021) highlights the role of strategic thinking and business acumen in navigating and leading through technological and organizational transformations. McKinsey & Company. (2022). delineates the multiple roles chief technology officers must play, emphasizing the importance of business acumen and strategic thinking in driving organizational success. Gartner (2023). underscores the need for strategic thinking and business acumen in adopting and integrating new technologies within

business strategies. Liebowitz (2020) discusses the evolving role of leadership in the digital age, highlighting the importance of strategic thinking and business acumen.

3. Collaboration and team building

Northouse (2021) covers various leadership theories and practices, with a focus on the importance of collaboration and team building in effective leadership. Deloitte (2022). discusses the evolving nature of work and the need for leaders to foster collaboration and build cohesive teams in a socially dynamic enterprise. McKinsey & Company. (2023) examines the challenges and strategies for fostering collaboration and team building in increasingly hybrid and remote work environments.

4. Adaptability and resilience in high-tech environments

Northouse (2021) covers various aspects of leadership, including the need for adaptability and resilience, particularly in rapidly changing high-tech environments. Deloitte (2022). discusses the evolving nature of work and highlights the necessity for leaders to be adaptable and resilient in the face of technological advancements and organizational changes. McKinsey & Company. (2023) examines strategies for organizations to enhance their adaptability and resilience, focusing on the demands of high-tech and fast-paced industries.

5. Cultivate innovation and research and development

McKinsey & Company. (2020) explores how crises can be a catalyst for innovation and emphasizes the importance of strong R&D capabilities in navigating turbulent times. Anthony (2020) provides a framework for companies to simultaneously innovate and transform their core business while investing in new growth opportunities through R&D. Gibson (2021). This book highlights the importance of team dynamics in fostering innovation and successful R&D projects within organizations. Goncalves (2021) This guide offers insights into how companies can nurture internal innovation and support R&D initiatives led by internal entrepreneurs. Barsh (2020) examine the role of leadership in driving innovation and effective R&D, highlighting case studies from various industries. Girotra (2021) explores how innovative business models and strategic R&D can mitigate risks and drive growth.

6. Addressing regulatory and compliance challenges

Biswas (2020). provides an in-depth analysis of regulatory compliance challenges in the pharmaceutical industry, with insights on maintaining compliance

and handling regulatory changes. Deloitte. (2021). discusses the evolving regulatory landscape across various industries, emphasizing the need for businesses to stay agile and proactive in addressing regulatory and compliance challenges. PricewaterhouseCoopers (2021) provides insights into global regulatory trends and the implications for businesses, offering strategies for compliance and risk management. Schwartz (2021) provides a comprehensive overview of regulatory compliance and ethics, including practical tools and techniques for navigating complex regulatory environments. Thomson Reuters. (2021) explores the costs and challenges of regulatory compliance, with a focus on strategies for managing regulatory change effectively.

7. Environmental sustainability initiative

Gates (2021) provides a detailed analysis of the technologies and strategies required to address climate change, emphasizing the role of business initiatives in driving environmental sustainability. Kiron (2020) explores how digital transformation can be leveraged to achieve sustainability goals, highlighting successful case studies of companies implementing environmental initiatives. McKinsey & Company. (2020). report examines the impact of climate change on businesses and provides guidance on how companies can develop resilience and sustainability initiatives to mitigate risks. Nidumolu (2009) argues that sustainability should be a core component of business strategy and innovation, offering insights into how companies can integrate environmental sustainability into their operations. World Economic Forum. (2020). report highlights the business opportunities and risks associated with environmental sustainability, providing a framework for companies to integrate nature-positive strategies into their business models.

8. Social responsibility and moral practice

Freeman (2020). explores the stakeholder theory, which emphasizes the importance of considering the interests and well-being of all stakeholders in business decisions, underscoring the moral responsibilities of companies. Porter (2019). discuss the concept of creating shared value, which integrates social responsibility into business strategy to benefit both society and business performance. Werther (2020). discuss how businesses can strategically integrate CSR to create sustainable value, emphasizing the ethical and moral obligations of companies to society.

9. Economic sustainability and long-term feasibility

Crane (2020) discuss the implications of the COVID-19 pandemic for corporate social responsibility, emphasizing the importance of sustainable business practices for long-term economic feasibility. Gao (2019) explores the dual logics of business sustainability and how they contribute to long-term economic performance. Kraus (2020) investigate the relationship between CSR, environmental strategy, green innovation, and their collective impact on long-term economic sustainability. Bocken (2020) presents a framework for assessing the transformative potential of sustainable business model innovation to ensure long-term economic sustainability. Lüdeke-Freund, (2019) review circular economy business models and their patterns, emphasizing their role in achieving economic sustainability and long-term business feasibility.

10. Key seps to fully utilize emerging Ttechnologies

Verhoef (2021) discuss digital transformation and present strategies for organizations to adopt and leverage emerging technologies. Iansiti, (2020) offer strategic guidance for organizations to thrive in the AI era, detailing essential steps for integrating AI and other emerging technologies. Gartner. (2020). report identifies top technology trends and provides actionable insights and steps for businesses to adopt these emerging technologies.

11. Key steps to fully utilize data analysis and decision-making

Davenport (2020) discusses the transformative impact of AI on data analytics and provides practical steps for integrating data analysis into decision-making processes. Wamba (2020) examines how dynamic capabilities influence the effective use of big data analytics for decision-making and firm performance. Mikalef (2020) highlights key steps for leveraging big data analytics capabilities to drive innovation and decision-making in dynamic environments. Maroufkhani (2020) presents an adoption model for SMEs to effectively utilize big data analytics for decision-making, providing practical steps and considerations.

12. Strategies to overcome the resistance of sustainable reform in enterprises

Benn (2020) discusses various strategies for organizational change to achieve sustain ability, addressing resistance through stakeholder engagement and leadership practices. Henisz (2019) discusses how environmental, social, and governance (ESG)

initiatives can create value and how companies can overcome resistance by demonstrating the financial benefits of sustainable practices. Rothaermel (2021) Offers strategies for building a sustainable competitive advantage through CSR, addressing resistance by aligning sustainability with business goals. Van der Waal (2020) discusses how setting sustainable development goals and integrating them into corporate values can help overcome resistance and drive sustainability reforms.

13. strategies for managing stakeholder expectations

Freeman (2021) discusses contemporary strategies for effective stakeholder engagement and managing their expectations by focusing on the human aspects of business interactions. Bridoux (2020) examines conditions under which powerful stakeholders allow managers to balance diverse stakeholder interests and expectations. Harrison (2019) discusses how companies can create value for stakeholders and manage their expectations to improve firm performance. Guerci (2020) investigates the role of HR practices in managing employee expectations as key stakeholders, focusing on ethical climates within organizations. Kazadi (2019) explores how co-creation with stakeholders during the innovation process can help manage their expectations and enhance knowledge creation.

14. Prediction of the future role of chief technology officer

Northouse (2021) discusses the evolving role of leaders in various contexts, including technology management, which can be extrapolated to predict the future roles and responsibilities of chief technology officers. Zhang (2018) explores the relationship between chief technology officer shareholding and corporate innovation, providing insights into the strategic importance of chief technology officers in future business environments. Bi (2023) examines current trends and challenges in high-tech enterprises, offering a perspective on the future roles chief technology officers might play in addressing these issues. Yuan (2022) highlights the importance of chief technology officers in leveraging financial subsidies to improve innovation quality, suggesting a growing strategic role for chief technology officers in the future. Kane (2021) discusses how leaders, including chief technology officers, can navigate and lead through technological transformations, offering predictions on the evolving responsibilities of chief technology officers. Gartner (2023) reports provide forward-looking insights on technology trends, which are crucial for predicting the future role of chief technology officers in adopting and managing these technologies. McKinsey &

Table 2.5 (Continued)

Scholar	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11	Factor 12	Factor 13	Factor 14
Kiron (2019)					√									
Biswas (2020)						√								
Schwartz (2021)						√								
Thomson (2021)						√								
Gates (2021)							√							
Kiron (2020)							√							
Freeman (2020)								√						
Porter (2019)								√						
Werther (2020)								√						
Crane (2020)									√					
Gao (2019)									√					
Kraus (2020)									√					
Verhoef (2021)										√				
Iansiti (2020)										√				
Davenport (2020)											√			
Wamba (2020)												√		

Table 2.5 (Continued)

Scholar	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7	Factor 8	Factor 9	Factor 10	Factor 11	Factor 12	Factor 13	Factor 14
Mikalef (2020)											√			
Benn (2020)												√		
Henisz (2019)												√		
Rothaermel (2021)												√		
Freeman (2021)													√	
Bridoux (2020)													√	
Harrison (2019)													√	
Guerci (2020)													√	
total	6	5	3	3	5	4	3	3	3	3	3	3	4	6

Factor 1 : Technical expertise and vision

Factor 2 : Business acumen and strategic thinking

Factor 3 : Collaboration and team building

Factor 4 : Adaptability and resilience in high-tech environments

Factor 5 : Cultivate innovation and research and development

Factor 6 : Addressing regulatory and compliance challenges

Factor 7 : Environmental sustainability initiative

Factor 8 : Social responsibility and moral practice

Factor 9 : Economic sustainability and long-term feasibility

Factor 10 : Key steps to fully utilize emerging technologies

Factor 11 : Key steps to fully utilize data analysis and decision-making

Factor 12 : Strategies to overcome the resistance of sustainable reform in enterprises

Factor 13 : Strategies for managing stakeholder expectations

Factor 14 : Prediction of the future role of chief technology officer

Management and organizational behavior have always studied and discussed the concept of leadership, and many scholars at home and abroad have also studied what is leadership, including what kind of leadership is effective, and the factors that affect leadership. At the same time, there are more and more books about leadership and leadership, and a large number of academic papers and monographs have also discussed the definition and connotation of leadership. In the past few years, books, newspapers and magazines related to leadership and leadership have been published and sold in many publishing houses, with a wide range of types, which reflect the importance of leadership and leadership and effective leadership in many organizations, The need for effective leadership is increasingly urgent.

Chinese scholars Chen Chuanming and Zhou Sanduo pointed out that "leadership is determined by the followers' personal thoughts, that is to say, leadership depends on the followers' willingness or personal will (Du Yuxian, 2002). The level of position and rank and the size of authority are not the influencing factors of leadership. The people who have decision-making management power and have an impact on the behavior of others are leaders, which is also the definition of leaders in management science". The theory of flexible leadership was put forward by Du Yuxian, a leading researcher (Du Yuxian, 2002). He thinks "Flexible leadership means that leaders do not use their own strong power, mandatory instructions and other high-pressure coercive measures, but use psychological tactics, use a flexible means to make others consciously produce a sense of persuasion and identity in their hearts, consciously and sincerely adopt the organizational will, and make this organizational will become their own conscious behavior. At present, flexible leadership is increasingly widely used, and even can be used to Sexual leadership, as a sustainable resource for development and utilization, has not only very important social value but also gradually become a trend of leadership management. Xing Yiqun, a famous leader researcher, has highlighted the qualities that a qualified leader should possess in the field of leadership theory, including moral cultivation,

ideological and moral character, and humanistic quality. He further put forward the so-called leadership quality theory. Xing Yiqun's leadership quality theory can be subdivided into modern quality theory and traditional quality theory. The former shows that leaders' quality can be acquired through acquired education practice, while the latter, on the contrary, believes that leaders' quality is innate (Xing Yiqun, 2007)..

Western scholar Alan Keith has defined leadership. He believes that creating a way and method to make people go all out and finally achieve glory is the so-called leadership (James Kouzes, 2010). Burke is a world-famous management scientist. He believes that leadership is the influence behavior and decision-making behavior that make the organization closer and closer to the goal. Burke also summarizes the main performance of leadership into three aspects, namely, leading employees, making decisions, and generating influence. (Huang Xunjing, 2008) Some experts and scholars believe that leadership is a skill, which is similar to technology, so it can be acquired through training and self-study.

Some experts believe that leaders do not have to have authority and rank. Leaders can be seen as an influence on others, but they must have influence. Peter G. Northouse is an expert in organizational behavior in the United States. He believes that "influence is a part of leadership, mainly manifested in the mechanism of influence on people who follow leaders (Peter Northouse, 2004). Leadership must include influence, which is a necessary condition for leaders to make decisions, otherwise there is no so-called leadership" John Maxwell, a well-known American leadership researcher, believes that "leadership assigned, delegated or transferred to others is not real leadership. The so-called leadership is accumulated from less to more influence, that is, leadership must be accumulated gradually, and cannot be obtained instantly from it." (John C. Maxwell, 2003). Some scholars and experts believe that leadership is a manifestation of ability, which can be used to reflect the level of leadership. Some Chinese scholars, such as Ren Zhen, define the concept of leadership as "having common goals and dreams, and the ability to guide and inspire others to establish and realize these common goals and dreams is leadership." (Ren Zhen, 2006). James Kouzes and Barry Posner are both well-known leaders in the United States, Their views on the concept of leadership are: "We can feel an influence in many places in our daily life, for example, in the army, schools,

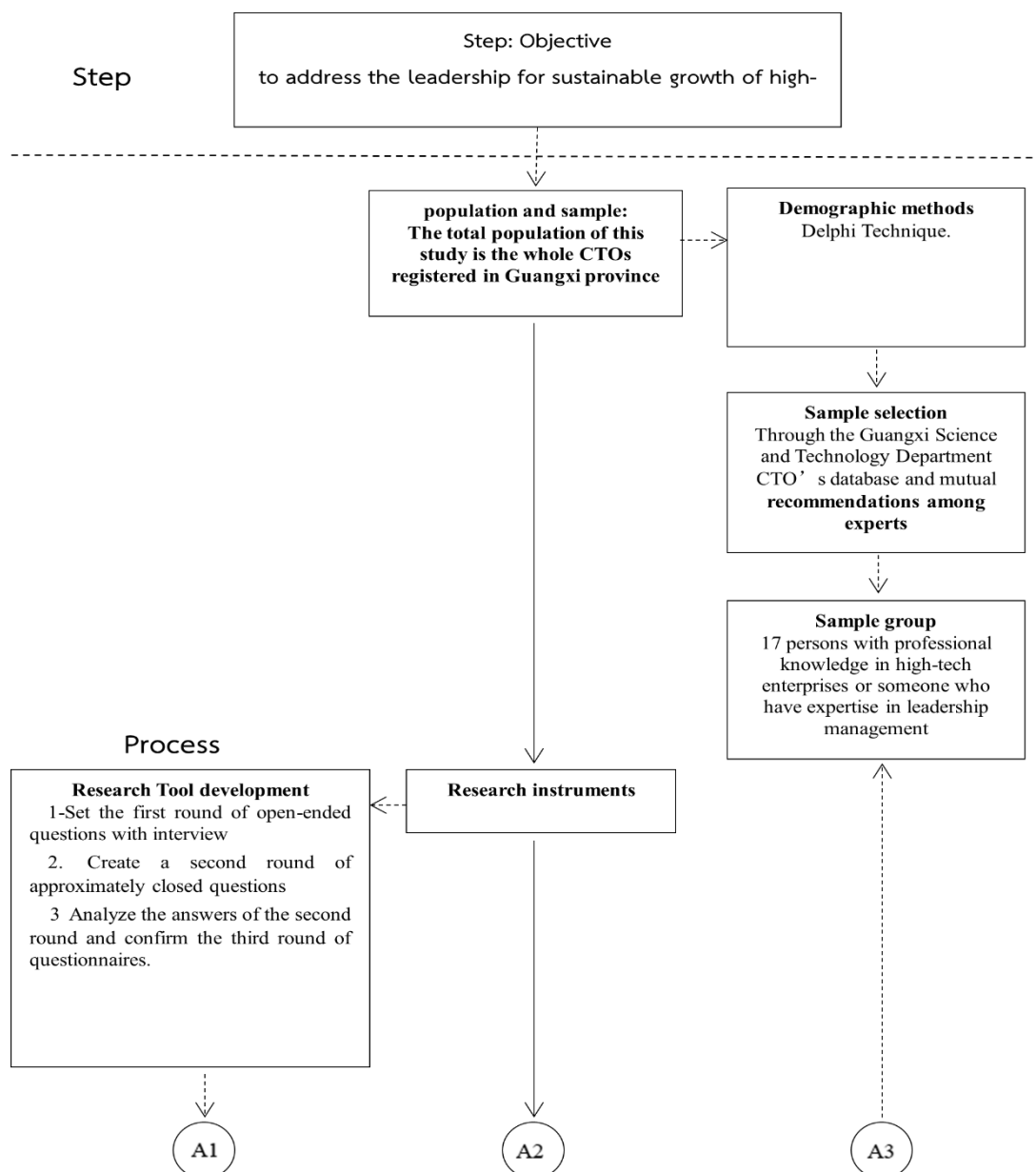
government departments and other social groups. This kind of influence exists in an interactive way, and has a definite purpose. It is everywhere and can be seen everywhere. Leadership can be seen as a kind of ability, a kind of leader how to guide others to make voluntary contributions in the organization. The ability to achieve goals is a special ability to influence interpersonal relationships. "(James Kouzes, 2006). Some experts and scholars believe that leadership can be understood as a process of achieving organizational goals. As for the concept of leadership, Heifetz, a famous leadership expert, believes that "leadership is to close or eliminate the gap between the reality and values of others, or to solve the conflicts caused by different values of others, which is a process, a process of adaptation"(Ronald A.Heifetz, 1994).A similar definition of leadership comes from Jon P Jon P. Howell and Dan L Dan L. Costley, their view is: "First of all, leadership is a process; second, this process refers to the personal influence of leaders on others in order to achieve team goals; finally, this influence is fair and reasonable in the eyes of others"(Howell J.P., Costley D.L., 2003).

Chapter 3

Research Methodology

This research objectives are to address the leadership for sustainable growth of high-tech enterprises in Guangxi Province.

The whole research process step summarized as shown in figure 3.1.



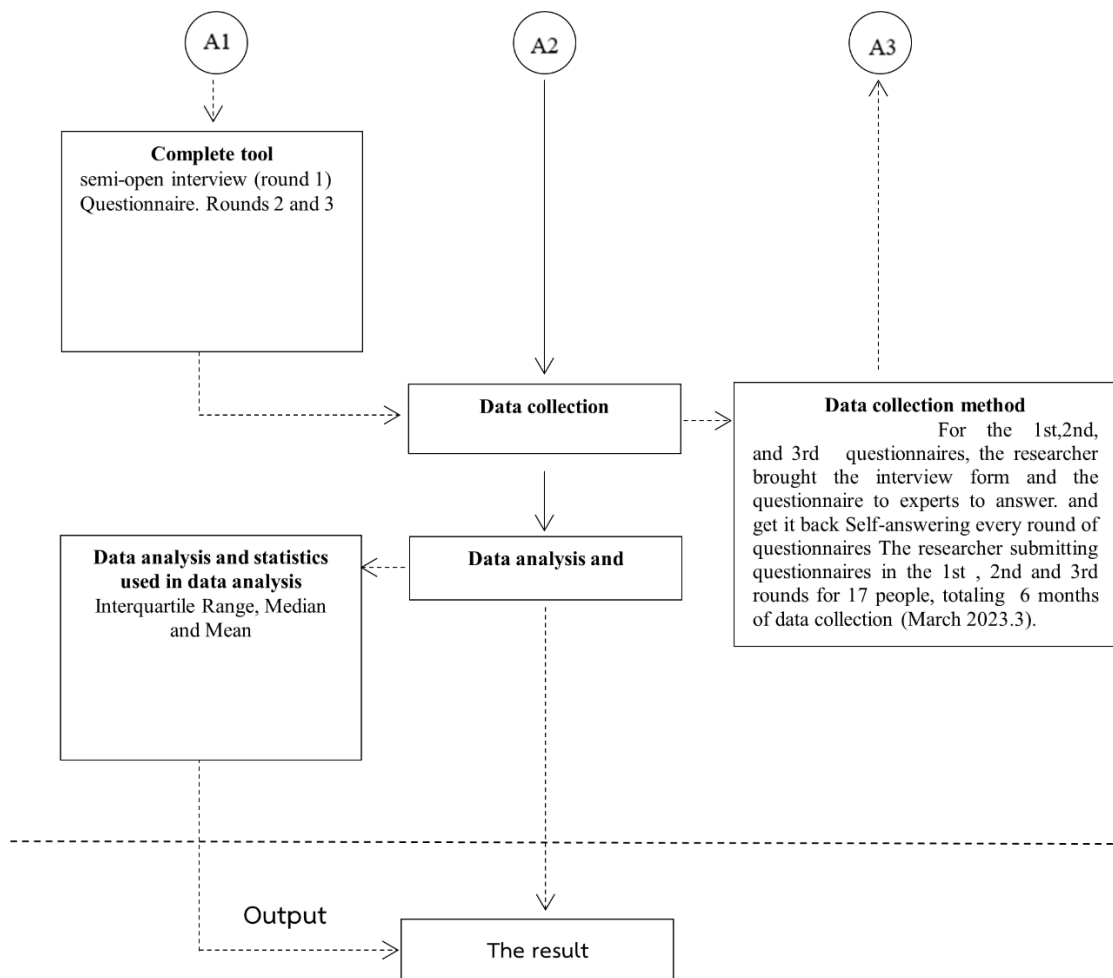


Figure 3.1 Details of the research process step

In this research study the researcher has defined the characteristics of the research informant group. research tools data collection and data analysis in step as follows

Step to address the leadership for sustainable growth of high-tech enterprises in Guangxi Province

Population Group and sample Group

The total population of this study is the whole chief technology officers registered in Guangxi province

The sample group are 17 persons with professional knowledge in high-tech enterprises or someone who have expertise in leadership management.

17 experts were selected from the Guangxi chief technology officer database. The selection criteria were that they had a professional title of associate senior or above and had certain leadership experience.

Experts recruited 17 people and used Delphi method to study the conceptual framework. Delphi Technique, which is a collection of information from experts, was conducted for 3 rounds, namely, in the Round1, the interview form was used according to the availability and convenience of the experts by collecting the results of all interviews and questionnaires in the Round 1. mentioned by experts to be used as information for the Round 2 of tools was made.

While the Round 2 used a 5-level estimation questionnaire selected from the interview and questionnaires. The questionnaire in which the experts agreed was 100 60 or more from the Round 1.

The Round 3 was a 5-level estimation questionnaire with the same content as the Round 2, complete with Both show statistical values by showing the median (median) and the interquartile range. (Interquartile Range) of the group and the original opinion of the respondent so that the respondent can review their original answer again.

Research Instruments

The tools used in this research are mainly three versions of questionnaires developed based on The Delphi Technique:

The first version is an open interview with experts.

The second version is a five-level estimation scale.

The third version is a five-level scale questionnaire, and its rating level is each expert from the Round 2 of questionnaires.

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While the Round 2 used a 5-level estimation questionnaire selected from the interview and questionnaires. The questionnaire in which the experts agreed was 100 60 or more from the Round 1.

The Round 3 was a 5-level estimation questionnaire with the same content as the Round 2, complete with Both show statistical values by showing the median (median) and the interquartile range. (Interquartile Range) of the group and the original opinion of the respondent so that the respondent can review their original answer again.

The procedure for creating the tool is as follows:

Open-ended interview (Round 1)

From the study in 14 elements, the researcher used to create an semi-open questionnaire about leadership. See Appendix C for details.

According to the results of the Open-ended interview form, based on Delphi technology, 17 experts were interviewed for the Round 1.

Questionnaire (Rounds 2 and 3)

It is bringing the answers to the questionnaire in the Round 1 which was answered by 17 experts to arrange the items in the order that many experts express the same opinion. Many people will arrange them in order until all items are completed. Both rounds of this questionnaire are taken from the answers of experts who have answered the questionnaire and were sorted and entered into the estimation scale questionnaire only.

Data collection

The researcher made a request for cooperation and contacted the experts about the research by themselves to ask about each expert's willingness to answer the questionnaire. The number of experts was 17 people in the following ways:

For the 1st 2nd and 3rd questionnaires, the researcher brought the interview form and the questionnaire to experts to answer. and get it back Self-answering every round of questionnaires The researcher submitting questionnaires in the Round 1, Round 2, Round 3 for 17 people, totaling 6 months of data collection (March 2023.3 –September 2023)

Data analysis and statistics used in data analysis

The data analysis from the questionnaire (Delphi Technique) for the 2nd and 3rd time was used to analyze data. Research Statistics mainly involves descriptive statistical analysis and expert consultation reliability analysis

Descriptive statistics

It mainly describes the basic information of the 17 experts invited, such as gender, age, education background, professional title, position, working years, enterprise scale, high-tech field of the enterprise, and other basic information.

Reliability analysis of expert consultation

Expert enthusiasm coefficient

The enthusiasm coefficient of experts can be reflected by the questionnaire recovery rate and effectiveness rate. The higher the recovery rate and efficiency, the higher the enthusiasm coefficient of experts.

Expert authority

Expert authority: No expert can be an authority on every question in the consultation, but the authority of the expert has a considerable impact on the reliability of the evaluation. Therefore, when dealing with the consultation results, the authority of the expert on a certain question should be considered. The authority of experts can be judged from two aspects, one is the basis for experts to make judgments, and the other is the familiarity of experts with the research on the leadership of high-tech enterprises. Previous studies have found that experts with authority greater than or equal to 0.70 are acceptable.

Interquartile Range, Median and Mean

Interquartile Range

Interquartile Range Considering the consistency of expert opinions, the researcher sets the criteria in action Consider as follows:

0.01-0.99 means expert opinions are highly consensus

1.00-1.50 means expert opinions are median consensus

1.51 and above means expert opinions are low or not consistent together

The researcher uses statements with an interquartile range of 1.51 and below, which is considered to be consensus.

The Percent, Arithmetic Mean and Median

The percent and arithmetic mean refers to the sum of all data in a group of data divided by the number of expert data.

The median is the middle value of this expert group of data. Arithmetic Mean and Median are both used to reflect the centralized trend of expert opinions.

From the 5-level estimation scale questionnaire, the researcher brought the scores weighted as follows:

- 5 means most likely,
- 4 means very likely,
- 3 means moderately likely,
- 2 means less likely,
- 1 means likely least likely

The median was obtained from the Answers from all experts Then interpret the meaning according to the criteria set by the researcher as follows:

The median of 4.50 and above means that the group of experts considers that The statement is most probable.

The median value is between 3.50-4.49, meaning that the group of experts considers that the statement is very likely.

The median value is between 2.50-3.49, meaning that the group of experts considers that the message is likely Moderately possible,

The median value is between 1.50-2.49, meaning that the group of experts agrees that the message is likely Less likely,

The median value is less than 1.50, indicating that the group of experts considers the message least likely.

This paper develops the questionnaire of Leadership for sustainable growth of high-tech enterprises in Guangxi Province, and determines the suitability and feasibility of the questionnaire answers through the results of the second and third rounds of questionnaire feedback. After the feedback of the third round of questionnaire, the median value is 3.5 or higher, which is considered as the high level agreed by experts. Experts believe that IQR (interquartile distance) is consensus at 1.50 and below.

Chapter 4

Data analysis results

This study aims to explore Leadership for sustainable growth of high-tech enterprises in Guangxi Province.

The study used the Delphi method to conduct questionnaire consultations with 17 experts. Experts were asked to answer four major questions: The qualities and abilities that chief technology officers in high-tech enterprises should possess, Sustainable development strategies that high-tech enterprises need to possess, chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises, Prediction of the Future Role of chief technology officer. The four major areas include 14 small questions, which are Technical expertise and vision, Business acumen and strategic thinking, Collaboration and team building, Adaptability and resilience in high-tech environments, Cultivate innovation and research and development, Addressing regulatory and compliance challenges, Environmental Sustainability Initiative, Social Responsibility and Moral Practice, Economic sustainability and long-term feasibility, Key steps to fully utilize emerging technologies, Key steps to fully utilize data analysis and decision-making, Strategies to overcome the resistance of sustainable reform in enterprises, Strategies for managing stakeholder expectations, Prediction of the Future Role of chief technology officer.

Setting

This thesis research was not influenced by any individual or organization. The experts also remain independent and the research location is Guangxi, China. We contacted and obtained findings via email and telephone interviews.

Expert Demographics and Characteristics

The research location of this paper is Guangxi, and the selected experts are all from universities, scientific research institutes, and high-tech enterprises in Guangxi. Among them, there are 6 professors from scientific research institutes and universities, and 11 executives from high-tech enterprises, accounting for 35.29% and 64.71% respectively. Regarding academic qualifications, 6 people have bachelor's degrees, 9 have master's degrees, and 2 have doctoral degrees.

Expert choice

The subjects of this study were screened through the Guangxi chief technology officer expert database. Guangxi chief technology officer expert database currently has 1,848 experts. The chief technology officer is an enterprise's senior manager and technological innovation leader who plans technology development strategies, grasps the direction of technological innovation, manages and allocates innovative resources, and organizes the implementation of innovative research and development. The status of the chief technology officer is determined by the trends of modern technological revolution and industrial revolution. It is an improvement and improvement of the chief engineer system implemented in the past. The chief technology officer has control over what kind of technological route an enterprise will pursue, what technological research and development direction it will take, how much it will invest in research and development, what level of technology and achievements it will achieve, and the transformation of its results. They will be responsible for the production and operation of the entire enterprise. determines the ultimate core competitiveness of the enterprise. It is the chief technology officer here who decides how far and how high the company can ultimately go. In an era when technology is the core competitiveness of an enterprise, we should elevate the status of the chief technology officer in the entire enterprise's production and operation system to a considerable height.

Selection criteria for corporate executives:

1. The selection criteria for corporate executives are that they must be recognized as chief technology officers by the Guangxi government and be listed in the Guangxi chief technology officer database. The Guangxi government has established a chief technology officer identification process and includes qualified corporate executives into the chief technology officer database.
2. The selected corporate executives must have high management level and scientific research level, and have a certain status in the industry.
3. Corporate executives from different fields were selected.

Selection criteria for experts from scientific research institutes and universities:

1. Must be an expert in management and have research on leadership and sustainable development.
2. Have a professional title of deputy senior or above and a certain industry status.

Data Analysis

The data analysis at this stage is an analysis of answers from field experts to explore Leadership for sustainable growth of high-tech enterprises in Guangxi Province. The Delphi method was conducted in 3 rounds. The Round 1 used a semi-open questionnaire and sent it to experts through emails and telephone interviews. The second and third rounds used questionnaires with feedback. The results of the previous round were fed back. To the same expert, there are 17 experts in total.

Round 1

The Round 1 used a semi-open questionnaire method to determine the main elements. After communicating with 17 experts, the data results obtained are as follows.

Section 1 Results of data analysis of the qualities and abilities that chief technology officers in high-tech enterprises should possess

There are 6 elements that experts believe are the qualities and abilities that chief technology officers in high-tech enterprises should possess,

1. Technical expertise and vision

We can know that 100% of experts agree that Technical expertise and vision require Technical expertise, 100% of experts agree that Technical expertise and vision require Evaluate emerging technologies, and 94.12% of experts agree that Technical expertise and vision require Harnessing complex technological environments. , 94.12% of experts agree that Technical expertise and vision require Building Scalable Solutions, 94.12% of experts agree that Technical expertise and vision require Building Scalable Solutions, and 88.24% of experts agree that Technical expertise and vision require Promoting innovation.

2. Business acumen and strategic thinking

Driving Technology Strategy, Understanding Business Objectives, Financial Management, Value Creation, Long-Term Planning, Performance Evaluation, A Customer-Centric Approach, Competitive Edge: These areas show a 100% agreement rate, indicating unanimous belief in these as critical competencies for a chief technology officer. This emphasizes the necessity for technology leaders to possess a deep understanding of business, financial planning skills, and a customer-centric design thinking approach. Decision-Making, Market Awareness, Risk Reduction: With a 94.12% agreement rate, these skills are highly regarded, but with some dissent. This may reflect that the methods and effectiveness of decision-making, market awareness, and risk management might vary in specific contexts. Innovation Consistency, Cross-Functional Collaboration, Opportunity Assessment: An 88.24% agreement rate suggests slightly lower recognition for these capabilities compared to others. This could indicate challenges or divergences in implementing innovations, fostering cross-departmental cooperation, and evaluating new opportunities.

3. Collaboration and team building

Core Competencies with Universal Agreement (100% Agree): Effective communication is recognized as fundamental, underscoring the chief technology officer's need to articulate complex technical strategies to diverse stakeholders. Encouraging team innovation and authorizing team members highlight the importance of fostering an innovative environment and empowering team members. Conflict resolution and encouraging open communication within the team emphasize the chief technology officer's role in maintaining harmony and promoting a healthy work culture. Ensuring shared goals and vision aligns all team efforts with the organization's broader objectives. Highly Valued Competencies (94.12% Agree): Collaboration with the technical team and establishing a high-performance team underscore the importance of technical leadership and team-building. Guidance, professional development, and adaptive leadership reflect the value placed on the chief technology officer's role in guiding team development and adapting leadership styles. Promoting knowledge sharing indicates the importance of a culture where information and insights are freely exchanged. Important for Organizational Alignment and Culture (88.24% Agree): Cross-functional collaboration stresses the need for the chief technology officer to work across departments to align technology with

business goals. Ensuring team diversity and inclusivity and commending achievements highlight the importance of fostering a diverse, inclusive environment and recognizing achievements. Insights from Expert Opinions: The consensus underscores the multifaceted role of the chief technology officer, balancing technical expertise with leadership, communication, and team-building skills. The universal agreement on several competencies suggests these are non-negotiable for success. Slightly lower agreement on some competencies may reflect nuances in execution across different organizations or industries. Strategic Implications: Organizations should ensure their chief technology officers possess these core competencies for success. Continuous professional development tailored to these competencies can help chief technology officers stay effective and responsive to changing technological landscapes. Emphasizing competencies like team innovation, diversity, and cross-functional collaboration can help cultivate a culture that aligns with modern organizational values and objectives.

4. Adaptability and resilience in high-tech environments

Highly Agreed Upon Competencies (100% Agree): Embracing subversion is crucial for chief technology officers to leverage disruptive technologies for organizational benefit. Flexibility in navigating uncertainty is essential for maintaining focus on long-term vision while overcoming challenges. Viewing failed issues as learning opportunities is vital for refining strategies and improving outcomes. Strategies for talent retention and development are critical for attracting, retaining, and nurturing top talent, driving innovation and growth. Leadership qualities are essential for guiding teams through change and aligning them with common objectives. Strongly Agreed Upon Competencies (94.12% Agree): Adapting to a dynamic technology landscape is crucial for effective leadership amidst rapid technological advancements. Agile decision-making, involving quick and informed responses to changing market conditions, is necessary for maintaining a competitive advantage. A rotation strategy, which includes the flexibility to pivot technology strategies based on market and customer needs, is essential for business alignment. Overcoming technical implementation challenges requires adaptability and problem-solving skills. Dealing with market fluctuations necessitates resilience to ensure organizational stability. A commitment to continuous learning is necessary for staying ahead in the technology leadership role.

5. Cultivate innovation and research and development

Highly Agreed Upon Competencies (100% Agree): Project risk identification and control capabilities are crucial for identifying and mitigating risks within projects, ensuring successful outcomes. Research decision-making ability is vital for assessing project feasibility from a macro perspective based on gathered information, guiding strategic decisions. Managing intellectual property and patent capabilities is essential for protecting the organization's technological innovations, leveraging competitive advantages, and contributing to long-term success. Integrating research and development with business objectives is critical for aligning R&D activities with organizational strategic goals, driving innovation, optimizing resource allocation, and maximizing technology investment value. Strongly Agreed Upon Competencies (94.12% Agree): The ability to obtain information is important for acquiring relevant knowledge, especially cutting-edge information related to the field's development direction, through various channels. Inferential innovation ability is key for understanding and innovating based on dissecting and reasoning about things, identifying internal connections, and innovating on that basis. Experimental observation ability is significant for closely monitoring project operations and keenly observing fluctuations to ensure project success. Creating an innovative culture is a crucial responsibility for fostering creativity, continuous improvement, and organizational growth through establishing an innovative culture within the technical team and the entire organization.

6. Addressing regulatory and compliance challenges

Highly Agreed Upon Responsibilities (100% Agree): Ensure safety and compliance: It's universally acknowledged that chief technology officers must ensure network security and data protection, complying with relevant regulations to safeguard organizational systems and data. Address data privacy and security issues: Given the prevalence of digital leaks and cyber threats, addressing data privacy and security is deemed critical for chief technology officers. They play a pivotal role in safeguarding organizational data and ensuring compliance with privacy regulations. Strongly Supported Responsibilities (88.24% Agree): Comply with industry standards and regulations: While overwhelmingly agreed upon, there's a slightly lower consensus on this responsibility. However, it's still recognized as crucial for chief

technology officers to ensure organizations adhere to legal requirements, industry best practices, and ethical guidelines to mitigate legal liabilities and reputation risks.

Section 2 Sustainable development strategies that high-tech enterprises need to possess

There are 3 elements that experts believe are the qualities and abilities that chief technology officers in high-tech enterprises should possess.

7. Environmental Sustainability Initiative

Highly Agreed Upon Sustainability Initiatives (100% Agree): Green IT Procurement: Prioritizing environmentally friendly IT equipment is universally recognized as crucial for reducing the organization's environmental impact. Carbon Footprint Tracking: Implementing a system to track and measure carbon emissions is unanimously agreed upon, emphasizing the importance of transparency and accountability in environmental management. Remote Work and Telecommuting: Promoting remote work options to reduce carbon emissions and improve work-life balance for employees garners unanimous support. Paperless Initiative: Encouraging paperless practices within organizations is deemed essential, aligning with digital transformation efforts and reducing paper waste. Green Building and Facility Management: Implementing green building practices and sustainable facility management, where applicable, is universally agreed upon as a means to reduce environmental impact. Strongly Supported Sustainability Initiatives (94.12% Agree): Sustainable Software Development: Encouraging sustainable practices in software development, such as optimizing code for energy efficiency, receives strong support. Employee Education and Participation: Educating employees on environmental sustainability and involving them in green initiatives is highly valued. Supplier Sustainable Development: Collaborating with suppliers to integrate sustainable practices into the supply chain is recognized as important for promoting sustainability throughout the organization. Green Data Center: Optimizing data center operations to reduce energy consumption and waste is seen as essential for sustainable IT operations. Environmental Certification: Striving to obtain recognized environmental certifications demonstrates a commitment to sustainable development and is strongly supported.

8. Social Responsibility and Moral Practice

Highly Agreed Upon Ethical and Socially Responsible Practices (100% Agree): Developing a comprehensive Corporate Social Responsibility (CSR) strategy aligned with organizational values and mission is universally recognized as crucial for ethical and socially responsible business practices. Adhering to ethical standards and implementing strict data protection measures to ensure user privacy and data security receives unanimous support. Advocating inclusive design practices to cater to different user groups and accessibility needs is unanimously agreed upon. Promoting diversity and inclusivity within the organization, including the technical team, is deemed essential for fostering an inclusive work environment. Cultivating a culture of responsible innovation and considering potential social and ethical impacts of technological initiatives is unanimously supported. Practicing transparency in technical operations and decision-making, as well as being accountable for the societal impacts of technological initiatives, is universally agreed upon. Promoting the ethical use of AI and data ethics, including developing responsible guidelines and addressing biases and privacy issues, garners unanimous support. Developing and implementing ethical standards and codes of conduct for the technical team to ensure awareness and adherence to ethical expectations is unanimously agreed upon. Upholding human rights and fair labor practices within technical operations and avoiding engagement in projects leading to violations receives unanimous support. Engaging with stakeholders and incorporating their feedback into technical strategies is recognized as crucial for ethical and socially responsible business practices.

Strongly Supported Ethical and Socially Responsible Practices (94.12% Agree): Promoting environmental sustainability initiatives in technology operations receives strong support, with a slightly lower but still significant agreement rate. Ensuring ethical practices throughout the supply chain and prioritizing cooperation with ethical suppliers garners strong support. Participating in local communities and social initiatives to address community needs, as well as encouraging technical teams to volunteer, receives strong support.

9. Economic sustainability and long-term feasibility

Universally Agreed Upon Strategies (100% Agree): Business Model Assessment is essential for ensuring that technology strategies align with the organization's revenue and cost optimization plans. Financial Planning and Budgeting are critical for creating realistic financial plans that align with strategic technology investments, ensuring a clear path to value generation and ROI. Risk Management, identifying and mitigating potential economic risks, is crucial for safeguarding the organization against market fluctuations and other uncertainties. Long-Term Innovation Investment is key to sustaining growth and staying competitive in the marketplace. Talent Management and Retention, attracting and retaining top technical talent, is essential for driving innovation and maintaining the organization's competitiveness. Environmental and Social Responsibility enhances the organization's reputation and stakeholder appeal.

Strongly Supported Strategies (94.12% Agree): Profitability and Cost Control focus on profitability through cost optimization, supported as essential, albeit with minor reservations, possibly reflecting the balance between cost-saving and investment in growth. Market Analysis and Trends are crucial for keeping abreast of market trends to guide technology decisions, ensuring the organization's relevance and competitiveness. Diversification of Income Streams is vital for financial stability and reducing dependence on singular income sources through technology exploration. Agility and Adaptability promote a culture of agility within the technical team, necessary for responding to market and customer needs swiftly. Strategic Partnerships are important for exploring partnerships to leverage technologies and expand market reach for growth and innovation. Continuous Monitoring and Evaluation, regular performance evaluation of technology strategies against economic goals, is key to adapting and making informed decisions.

Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises

There are 4 elements that experts believe are the qualities and abilities that chief technology officers in high-tech enterprises should possess.

10. Key steps to fully utilize emerging technologies

Strategies with Universal Agreement (100% Agree): Strategic Coordination is essential for ensuring technology plans support and enhance the organization's long-term goals and competitive edge. Collaboration and Partnership are vital for gaining insights into cutting-edge technologies and fostering innovation through external partnerships. Data-driven Decision-making underlines the importance of basing technical decisions on solid data and analytics to support the adoption of emerging technologies. Talent Acquisition and Development recognize the need for a skilled workforce capable of leveraging new technologies effectively. Risk and Security Management highlight the necessity of assessing risks and prioritizing security and privacy in the adoption of new technologies. Technical Roadmap advocates for a structured approach to integrating and deploying emerging technologies to minimize disruption.

Strategies with Strong Support (Over 88% Agree): Technical Landscape Analysis emphasizes staying informed on technological advancements and market trends, though some reservations might reflect concerns about the practicality of keeping pace with rapid changes. Innovative Mindset encourages fostering creativity and exploration within teams, acknowledging minor reservations possibly linked to balancing innovation with practical constraints. Scalability and Flexibility are critical for ensuring technologies can grow and adapt with the organization, with slight reservations perhaps due to the challenges in predicting future needs. Regulatory Compliance stresses the importance of adhering to evolving legal and standards frameworks, with slight reservations likely due to the complexity of compliance across different jurisdictions. User-centric Approach advocates for prioritizing customer value and experience in technology implementations, with minor dissent possibly reflecting the challenges in aligning technology with diverse user needs. Continuous Evaluation and Improvement call for ongoing assessment of technology's impact, with some reservations perhaps indicating concerns about the resources required for continuous reevaluation.

11. Key steps to fully utilize data analysis and decision-making

Universally Agreed Upon Strategies (100% Agree): Predictive Analysis for Prediction: Leveraging predictive analysis to anticipate future trends, market dynamics, and risks is universally recognized as essential for proactive decision-

making. Real-time Analysis for Agility: Implementing real-time analysis capabilities enables organizations to swiftly respond to evolving situations, enhancing agility and competitiveness. Continuous Improvement: Embracing a culture of continuous improvement ensures that data analysis practices remain effective and aligned with organizational goals over time.

Strategies with Strong Support (Over 88% Agree): Visualization and Communication: Utilizing data visualization tools to communicate insights effectively is widely acknowledged, although there are some reservations, possibly related to concerns about the practical implementation or effectiveness of visualization techniques. Ethical Considerations: While the majority agree on the importance of ethical standards in data analysis, there are some dissenting voices, likely reflecting the complexity of balancing data utilization with privacy and ethical concerns.

12. Strategies to overcome the resistance of sustainable reform in enterprises

Universally Agreed Upon Strategies (100% Agree): Effective Communication: Transparent and clear communication about the reasons behind change, its alignment with organizational goals, and regular updates on progress are universally recognized as crucial for successful change management. Create a Shared Vision: Developing a shared vision that resonates with employees and emphasizes the positive impact of change is unanimously acknowledged as essential for gaining employee support. Provide Training and Support: Offering training, development projects, and continuous support to equip employees with the necessary skills for adapting to change is universally seen as crucial for successful implementation. Celebrate Rapid Victories: Recognizing and celebrating quick wins to demonstrate the positive outcomes of change and boost morale is unanimously agreed upon as an effective practice. Break Down Changes into Manageable Steps: Breaking down changes into smaller, manageable steps to facilitate gradual adaptation and celebrating progress at each step is universally recognized as beneficial. Lead by Example: Demonstrating a commitment to change and serving as a role model to inspire others is unanimously seen as vital for successful change management. Monitoring and Adjustment: Continuously monitoring progress, being responsive to feedback, and adjusting methods as needed are universally acknowledged as essential for successful change implementation.

Strategies with Strong Support (Over 88% Agree): Early Engagement with Stakeholders: Involving key stakeholders from the outset, seeking their opinions, and incorporating their feedback into the change plan is widely seen as important, although there are minor reservations. Authorize Change Agents: Identifying change advocates within the organization and empowering them to lead by example and share success stories is also highly valued, albeit with slight dissent. Addressing Fear and Uncertainty: Acknowledging and addressing employees' fears and concerns openly and generously throughout the transition process is widely seen as necessary, although there are some reservations.

13. Strategies for managing stakeholder expectations

Universally Agreed Upon Strategies (100% Agree): Open and Transparent Communication: Cultivating a culture of openness and transparency with stakeholders, regularly updating them on the progress of technical projects, is seen as crucial. Establish Clear Goals and Objectives: Clearly defining the goals and objectives of technical projects to ensure stakeholders have a clear understanding of the project's purpose and expected outcomes is unanimously supported. Engage Stakeholders as Early as Possible: Early engagement of stakeholders in the project lifecycle to gather their insights and enhance their ownership and support is universally valued. Provide Demonstrations and Progress Reports: Offering demonstrations of technical solutions or prototypes and providing progress reports to visualize benefits and demonstrate value is unanimously agreed upon. Manage Risks and Issues: Proactively identifying and managing risks, and communicating mitigation plans to stakeholders, is seen as essential for instilling confidence in project management. Continuous Engagement: Maintaining continuous engagement with stakeholders throughout the project lifecycle, ensuring their expectations are considered, is universally supported. Celebrate Achievements: Celebrating project milestones and successes with stakeholders to strengthen their support and enthusiasm for future plans is unanimously agreed upon.

Strongly Supported Strategies (Over 88% Agree): Actively Listening: Actively listening to stakeholder concerns, feedback, and expectations, showing empathy, and resolving issues quickly is widely supported, with minimal dissent. Set Realistic Expectations: Setting realistic expectations regarding timelines, costs, and potential outcomes to maintain stakeholder trust is strongly supported, though there are slight

reservations. Building Trust and Credibility: Demonstrating technical expertise to build trust and credibility with stakeholders is highly valued, with minor dissent. Resolve Conflicts and Differences of Opinion: Proactively addressing and seeking compromise in conflicts and disagreements among stakeholders is strongly supported, with some reservations.

Section 4 Prediction of the Future Role of chief technology officer

There are 1 elements that experts believe are the qualities and abilities that chief technology officers in high-tech enterprises should possess.

14. Prediction of the Future Role of chief technology officer

Universally Agreed Upon Responsibilities (100% Agree): Focus on Digital Transformation: The chief technology officer's leadership in digital transformation is seen as pivotal, guiding the organization towards adopting emerging technologies and digital processes to enhance efficiency and customer experience. Data-driven Decision-making: Utilizing data analysis and artificial intelligence to make informed decisions is recognized as a core responsibility, highlighting the importance of leveraging big data for competitive advantage. Leading Position in Cybersecurity: The unanimous agreement on the chief technology officer's crucial role in cybersecurity reflects the growing awareness and importance of protecting sensitive data and intellectual property in the digital age. Sustainability and Ethical Technology Adoption: There's a strong consensus on the need for the chief technology officer to advocate for and implement sustainable and ethical technology practices, underscoring the increasing concern for responsible technology use. Talent Management and Skill Enhancement: The emphasis on the chief technology officer's role in talent management and fostering a culture of continuous learning is indicative of the importance placed on maintaining a highly skilled technical workforce. Emphasize the Innovation Ecosystem: The universal agreement on the chief technology officer's role in fostering innovation ecosystems through partnerships and collaborations highlights the strategic importance of open innovation and technology acquisition.

Strongly Supported Responsibilities (Over 88% Agree): Customer-Centric Innovation: The near-universal support for focusing on user experience and meeting customer needs through technological solutions indicates a strong belief in the value of customer-centric approaches in innovation. Agility and Flexibility: The emphasis on

adopting agile methods and promoting an adaptive culture to respond to market and customer needs reflects the growing recognition of the importance of agility in today's fast-paced business environment. Collaboration with Senior Executives: The strong support for the chief technology officer's collaboration with other executives to align technology strategy with broader business goals underscores the importance of cross-functional strategic alignment. Addressing Regulatory Challenges: The recognition of the chief technology officer's role in navigating complex regulatory environments and ensuring compliance with data protection and privacy regulations highlights the growing complexity and importance of regulatory compliance in the tech industry.

All variables were determined through the Round 1 of semi-open questionnaires, and the Round 2 of questionnaires will be conducted later. The questionnaires will feed back the variables in the Round 1 for experts to score.

Round 2

While the Round 2 used a 5-level estimation questionnaire. The questionnaire in which the experts agreed was 80 from the Round 1.

Section 1 Results of data analysis of the qualities and abilities that chief technology officers in high-tech enterprises should possess

This section discusses the results of data analysis of the qualities and abilities that chief technology officers in high-tech enterprises should possess. there are 6 main elements: technical expertise and vision, business acumen and strategic thinking, collaboration and team building, adaptability and resilience in high-tech environments, cultivate innovation and research and development, addressing regulatory and compliance challenges. The main elements are divided into 57 Item.

It can be seen from results

Median Score of 5

These elements are top performers, indicating high satisfaction among participants. They include but are not limited to:

Technical expertise and vision (e.g., technical expertise, evaluating emerging technologies, addressing technical challenges, promoting innovation, etc.)

Collaboration and team building (cross-functional collaboration, collaboration with the technical team, encouraging team innovation, authorizing team members, etc.)

Adaptability and resilience (adapting to a dynamic technology landscape, agile decision-making, experimentation and innovation, etc.)

Cultivating innovation and R&D (ability to obtain information, inferential innovation ability, project risk identification and control, R&D decision-making ability, etc.)

Median Score of 4

This score reflects good performance but with room for improvement. These elements may include:

Business acumen and strategic thinking (driving technology strategy, understanding business objectives, market awareness, cross-functional collaboration, etc.)

Team building and leadership (conflict resolution, ensuring team diversity and inclusivity, adaptive leadership, etc.)

Challenges in High-tech environments (dealing with market fluctuations, leading through change, etc.)

Median Score of 3

Elements in this range are performing averagely and clearly require attention and improvement. After communicating with experts, those with a median score of 3 were modified.

Median Score of 2

These elements are underperforming and urgently need attention and significant improvement. After communicating with experts, those with a median score of 2 were deleted.

Table 4.1 Modified and deleted items of The qualities and abilities that chief technology officers in high-tech enterprises should possess

Original Item	Mdn	IQR	New Item	Recommendations
Building Scalable Solutions	2	1		delete
decision-making	3	1	Science and technology decision-making ability	modify
Reduce risk	3	1	Reduce technology risks and challenges	modify
Shared goals and vision	2	1		delete
Talent retention and development	3	1	Tech Talent Retention and Development	modify

Section 2 Results of data analysis of sustainable development strategies that high-tech enterprises need to possess

This section discusses the results of data analysis of sustainable development strategies that high-tech enterprises need to possess. there are 3 main elements: Environmental Sustainability Initiative, Social Responsibility and Moral Practice, Economic sustainability and long-term feasibility. The main elements are divided into 39 Item.

From results we can know.

Environmental Sustainability Initiative

Energy efficiency: Median score of 4 with an IQR of 1.5 indicates good performance and moderate agreement among participants. However, there is some variability in perceptions.

Renewable energy: Similar to energy efficiency, renewable energy also scored a median of 4 with a larger IQR of 2, suggesting more varied opinions among participants.

Green IT procurement: With a median score of 4 and an IQR of 2, green IT procurement faces similar variability in perceptions as renewable energy.

Circular economy practice: Median score of 4 with an IQR of 2 indicates general agreement on the importance of circular economy practices, but opinions vary regarding its implementation and effectiveness.

Virtualization and cloud computing: Median score of 4 with an IQR of 1.5 suggests a positive perception overall, but some variability in agreement among participants.

Carbon footprint tracking: Similar to virtualization and cloud computing, carbon footprint tracking scored a median of 4 with a slightly larger IQR of 2, indicating some variability in perceptions.

Sustainable software development: Median score of 4 with an IQR of 1 indicates moderate agreement among participants, but there is room for improvement.

Remote work and remote work: Median score of 4 with an IQR of 1 suggests general agreement on the importance of remote work initiatives.

Paperless initiative: High median score of 5 with a low IQR of 1 indicates strong agreement among participants regarding the importance and effectiveness of paperless initiatives.

Employee education and participation: Median score of 4 with an IQR of 1.5 suggests generally positive perceptions, but some variability in agreement among participants.

Social Responsibility and Moral Practice

Corporate social responsibility (CSR) strategy: Median score of 4 with an IQR of 1 indicates moderate agreement among participants regarding the importance of CSR strategies.

Ethical technology use: Similar to CSR strategy, ethical technology use scored a median of 4 with a low IQR of 1, indicating general agreement among participants.

Inclusive design: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of inclusive design practices.

Environmental sustainability: Median score of 4 with an IQR of 1 indicates general agreement on the importance of environmental sustainability efforts.

Diversity and inclusion: Similar to environmental sustainability, diversity and inclusion scored a median of 4 with a low IQR of 1, suggesting general agreement among participants.

Ethical supply chain: High median score of 5 with a low IQR of 1 indicates strong agreement among participants regarding the importance of ethical supply chain practices.

Responsible innovation: Similar to ethical supply chain, responsible innovation also scored a median of 5 with a low IQR of 1, indicating strong agreement among participants.

Transparency and accountability: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of transparency and accountability practices.

Ethical artificial intelligence and Data Ethics: Similar to transparency and accountability, ethical AI and data ethics scored a median of 4 with a low IQR of 1, indicating general agreement among participants.

Community participation: Median score of 2 with an IQR of 1 suggests lower agreement among participants regarding the importance of community participation efforts.

Ethical standards and code of conduct: Median score of 4 with an IQR of 1 indicates general agreement on the importance of ethical standards and codes of conduct.

Human rights and labor practices: Median score of 4 with an IQR of 2 indicates general agreement on the importance of human rights and labor practices, but with some variability in perceptions.

Stakeholder engagement: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of stakeholder engagement practices.

Economic Sustainability and Long-Term Feasibility

Business model assessment: Median score of 4 with an IQR of 1 indicates moderate agreement on the importance of business model assessment practices.

Financial planning and budgeting: Similar to business model assessment, financial planning and budgeting scored a median of 4 with a low IQR of 1, indicating general agreement among participants.

Profitability and cost control: High median score of 5 with a low IQR of 1 indicates strong agreement among participants regarding the importance of profitability and cost control efforts.

Market analysis and trends: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of market analysis and trend monitoring.

Diversification of income streams: Median score of 4 with an IQR of 1.5 indicates moderate agreement on the importance of income stream diversification efforts.

Risk management: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of risk management practices.

Long-term innovation investment: Median score of 4 with an IQR of 1.5 indicates moderate agreement on the importance of long-term innovation investment.

Agility and adaptability: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of agility and adaptability.

Strategic partnership: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of strategic partnership practices.

Talent management and retention: High median score of 5 with a low IQR of 1 indicates strong agreement among participants regarding the importance of talent management and retention efforts.

Environmental and social responsibility: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of environmental and social responsibility practices.

Continuous monitoring and evaluation: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of continuous monitoring and evaluation practices.

Table 4.2 Deleted items of sustainable development strategies that high-tech enterprises need to possess

Item	Mdn	IQR	Recommendation
Supplier Sustainable Development	2	1	delete
Community participation	2	1	delete

There are 2 elements: Supplier Sustainable Development, Community participation. They are Median core of 2 is below core of 2.5. According to the requirements of the research method and the suggestions of experts, we delete them.

Section 3 Results of data analysis of chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises

This section discusses the results of data analysis of chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises. there are 4 main elements: Key steps to fully utilize emerging technologies, Key steps to fully utilize data analysis and decision-making, Strategies to overcome the resistance of sustainable reform in enterprises, Strategies for managing stakeholder expectations. The main elements are divided into 39 Item.

From the results we can see.

Key Steps to Fully Utilize Emerging Technologies

Technical Landscape Analysis: Median score of 5 with an IQR of 1 suggests strong agreement on the importance of conducting comprehensive technological landscape analyses.

Strategic Coordination: Median score of 3 with an IQR of 1 indicates moderate agreement on the importance of coordinating technology plans with long-term strategic goals.

Innovative Mindset: Median score of 5 with an IQR of 1 suggests strong agreement on the importance of cultivating an innovative mindset within the technical team.

Pilot Project: Median score of 4 with an IQR of 1 indicates moderate agreement on the importance of implementing pilot projects to test emerging technologies.

Collaboration and Partnership: Median score of 4 with an IQR of 2 suggests varied opinions regarding the importance of collaborating with external partners to explore emerging technologies.

Data-Driven Decision-Making: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of making technical decisions based on data-driven insights.

Talent Acquisition and Development: Median score of 5 with an IQR of 1 indicates strong agreement on the importance of investing in talent acquisition and development.

Risk and Security Management: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of assessing risks associated with emerging technologies.

Scalability and Flexibility: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of evaluating the scalability and flexibility of emerging technologies.

Regulatory Compliance: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of ensuring regulatory compliance when adopting emerging technologies.

Technical Roadmap: Median score of 5 with an IQR of 1 suggests strong agreement on the importance of developing a technology roadmap for integrating emerging technologies.

User-Centric Approach: Median score of 5 with an IQR of 1 suggests strong agreement on the importance of adopting a user-centric approach when implementing emerging technologies.

Continuous Evaluation and Improvement: Median score of 5 with an IQR of 1 suggests strong agreement on the importance of continuously evaluating and improving technology adoption strategies.

Key Steps to Fully Utilize Data Analysis and Decision-Making

Visualization and Communication: Median score of 4 with an IQR of 2 suggests varied opinions regarding the importance of utilizing data visualization tools for communication.

Predictive Analysis for Prediction: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of using predictive analysis for predicting future trends.

Real-Time Analysis of Agility: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of implementing real-time analysis for agile decision-making.

Ethical Considerations: Median score of 4 with an IQR of 2 suggests varied opinions regarding the importance of ensuring ethical considerations in data analysis processes.

Continuous Improvement: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of embracing a culture of continuous improvement in data analysis practices.

Strategies to Overcome Resistance to Sustainable Reform in Enterprises

Effective Communication: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of clear and transparent communication during sustainable reform initiatives.

Early Engagement with Stakeholders: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of engaging stakeholders early in the change process.

Create a Shared Vision: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of developing a shared vision for sustainable reform initiatives.

Authorize Change Agents: Median score of 4 with an IQR of 1.5 suggests moderate agreement on the importance of identifying and authorizing change advocates within the organization.

Provide Training and Support: Median score of 5 with an IQR of 1 indicates strong agreement on the importance of providing training and support during sustainable reform initiatives.

Addressing Fear and Uncertainty: Median score of 4 with an IQR of 2 suggests varied opinions regarding the importance of addressing fear and uncertainty during sustainable reform initiatives.

Celebrate Rapid Victory: Median score of 4 with an IQR of 1.5 suggests moderate agreement on the importance of identifying and celebrating rapid victories during sustainable reform initiatives.

Break Down Changes into Manageable Steps: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of breaking down changes into manageable steps.

Lead by Example: Median score of 5 with an IQR of 1 suggests strong agreement on the importance of leading by example during sustainable reform initiatives.

Monitoring and Adjustment: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of continuously monitoring and adjusting sustainable reform initiatives.

Strategies for Managing Stakeholder Expectations

Open and Transparent Communication: Median score of 5 with an IQR of 1 suggests strong agreement on the importance of open and transparent communication with stakeholders.

Actively Listening: Median score of 5 with an IQR of 1 suggests strong agreement on the importance of actively listening to stakeholders' concerns and feedback.

Set Realistic Expectations: Median score of 5 with an IQR of 1 suggests strong agreement on the importance of setting realistic expectations for technical projects.

Establish Clear Goals and Objectives: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of establishing clear goals and objectives for technical projects.

Engage Stakeholders as Early as Possible: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of engaging stakeholders early in technical projects.

Provide Demonstrations and Progress Reports: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of providing demonstrations and progress reports to stakeholders.

Manage Risks and Issues: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of proactively managing risks and issues in technical projects.

Building Trust and Credibility: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of building trust and credibility with stakeholders.

Resolve Conflicts and Differences of Opinion: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of resolving conflicts constructively.

Continuous Engagement: Median score of 3 with an IQR of 1 suggests moderate agreement on the importance of maintaining continuous engagement with stakeholders.

Celebrate Achievements: Median score of 4 with an IQR of 1 suggests moderate agreement on the importance of celebrating achievements with stakeholders.

Table 4.3 Modify items of chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises

Original Item	Mdn	IQR	New Item	Recommendations
Strategic coordination	3	1	Science and Technology Strategy Coordination	modify
Continuous engagement	3	1	Continuous innovation engagement	modify

There are 2 elements: strategic coordination, Continuous engagement. They are Median core of 3 is below core of 3.5. According to the requirements of the research method and the suggestions of experts, we revised it, and the new item are Science and Technology Strategy Coordination, Continuous innovation engagement.

Section 4 Results of data analysis of Prediction of the Future Role of chief technology officer

This section discusses the results of data analysis of Prediction of the Future Role of chief technology officer. There is only 1 main element and 10 Items.

Focus on Digital Transformation: The chief technology officer leads digital transformation efforts, integrating emerging technologies to enhance efficiency and customer experience, with a high priority (Mdn: 5) and moderate consensus (IQR: 1.5).

Data-driven Decision-making: By leveraging data analysis and AI, the chief technology officer makes strategic decisions to boost business growth, showing strong importance (Mdn: 4) and high agreement (IQR: 1).

Leading Position in Cybersecurity: The chief technology officer ensures robust cybersecurity measures against increasing threats, with a critical role (Mdn: 5) and moderate consensus (IQR: 1.5).

Sustainability and Ethical Technology Adoption: Commitment to sustainable and ethical tech practices marks the chief technology officer's approach, emphasizing environmental and social considerations (Mdn: 4, IQR: 2).

Customer-Centric Innovation: The chief technology officer focuses on user experience and meeting customer needs through innovative technologies, prioritizing this approach (Mdn: 5, IQR: 1).

Agility and Flexibility: Emphasizing agile methodologies, the chief technology officer promotes adaptability to market and customer changes, with a strong focus (Mdn: 5, IQR: 2).

Collaboration with Senior Executives: The chief technology officer works in tandem with other top executives to ensure technology aligns with business goals, showing significant but varied emphasis (Mdn: 3, IQR: 2).

Talent Management and Skill Enhancement: Attracting and nurturing top technical talent is a key chief technology officer role, with a high priority (Mdn: 5) and strong agreement (IQR: 1).

Emphasize the Innovation Ecosystem: The chief technology officer fosters partnerships and open innovation for a dynamic tech ecosystem, with a top priority (Mdn: 5, IQR: 1).

Addressing Regulatory Challenges: Navigating regulatory complexities and ensuring compliance is crucial for the chief technology officer, with a critical focus (Mdn: 5, IQR: 1.5).

Table 4.4 Modify items of Prediction of the Future Role of chief technology officer

Original Item	Mdn	IQR	New Item	Recommendations
Collaboration with senior executives	3	2	Collaboration closely with other senior executives	modify

There is elements: Collaboration with senior executives median core of 3 is below core of 3.5. According to the requirements of the research method and the suggestions of experts, we revised it, and the new item is Collaboration closely with other senior executives.

Round 3

This round is the third round of the Delphi expert consultation method. I have completed the first two rounds of expert opinion collection and feedback. Judging from the results of the Round 2, most items have reached consensus, but there are still 10 items that have not reached consensus. In this round, the results (median, IQR) and revised content of the Round 2 were anonymously fed back to the same group of experts, allowing the experts to better understand the problem or re-evaluate their positions, hoping to further refine these consensuses, Resolve disagreements to better interpret and present results in the third round of feedback.

Table 4.5 The result of Round 3: the qualities and abilities that chief technology officers in high-tech enterprises should possess

Mean Ranking	No	The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mean	IQR
Adaptability and resilience in high-tech environments					
6	1	The high-tech industry is susceptible to market fluctuations and disruptive trends. The flexibility of the chief technology officer enables them to withstand market fluctuations, positioning the organization for long-term success.	5	4.53	1
3	2	In a fast-paced high-tech environment, the resilience of the chief technology officer enables them to effectively lead change. They maintain a positive perspective, motivate the entire team, and unite the entire organization around common goals.	5	4.59	1
11	3	The high-tech industry has experienced frequent technological progress and innovation. The chief technology officer must adapt to these changes and constantly update their knowledge and skills to maintain relevance and effectively lead technology initiatives.	4	4.24	1
8	4	In a high-tech environment, market conditions and customer needs can rapidly change. The adaptability of the chief technology officer enables them to make quick and wise decisions and quickly respond to emerging opportunities and challenges.	5	4.47	1

Table 4.5 (Continued)

Mean Ranking	No	The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mean	IQR
1	5	The high-tech industry is easily influenced by disruptive technologies that may reshape the market. The flexibility of the chief technology officer enables them to accept interruptions and identify opportunities to utilize these technologies for the benefit of the organization.	5	4.71	1
14	6	Uncertainty is widely present in the high-tech field, such as changes in regulations, geopolitical factors, chief technology officers, and economic fluctuations. The flexibility of the chief technology officer enables them to overcome uncertainty while maintaining a focus on the organization's long-term vision.	5	4.18	0
3	7	7. Rotation strategy: The adaptability of the chief technology officer enables them to shift to technology strategies when necessary. They can shift their focus based on market trends and customer needs, ensuring that technical solutions align with business goals.	4	4.59	1
11	8	Flexibility encourages chief technology officer to cultivate a culture of experimentation and innovation within the organization. By accepting calculated risks, the chief technology officer can drive technology driven initiatives, thereby creating a competitive advantage.	5	4.24	1

Table 4.5 (Continued)

Mean Ranking	No	The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mean	IQR
14	9	In the high-tech field, not all initiatives can be successful. The flexibility of the chief technology officer enables them to view failure as a learning opportunity and adjust strategies to improve future outcomes.	4	4.18	1
3	10	Implementing new technologies may bring unforeseen challenges. The adaptability of the Chief Technical Officer enables them to adjust implementation plans and effectively overcome obstacles.	4	4.59	1
9	11	The high-tech field is highly competitive for top technical talents. The flexibility of the chief technology officer enables them to develop strategies to retain and cultivate the best talents, ensuring the organization's ability to innovate and grow.	5	4.35	1
6	12	Adaptability and resilience drive chief technology officer to engage in continuous learning and professional development. Continuously understanding the latest trends and best practices can improve chief technology officer's efficiency as a technology leader.	4	4.53	1

Table 4.5 (Continued)

Mean Ranking	No	The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mean	IQR
2	13	In the era of widespread digital leaks and cyber threats, addressing data privacy and security issues is crucial for chief technology officers (chief technology officers). As the custodian of technology infrastructure and data management, chief technology officer plays a crucial role in ensuring that the organization's data remains protected and complies with privacy regulations.	5	4.65	1
10	14	Having a deep understanding of network security and data protection, ensuring that the organization's technical systems and data are secure and comply with relevant regulations.	5	4.29	0.5
11	15	Compliance with industry standards and regulations is a key responsibility of the chief technology officer (chief technology officer) to ensure that organizations comply with legal requirements, industry best practices, and ethical guidelines. Failure to comply with these standards may result in legal liability, reputation damage, and operational interruption.	4	4.24	1
12	16	Business acumen and strategic thinking With their professional knowledge, chief technology officers can create and implement comprehensive technical strategies that are aligned with the overall goals of the organization. They have identified opportunities to leverage technology to gain competitive advantage, optimize processes, and drive growth	4	4.41	1

Table 4.5 (Continued)

Mean Ranking	No	The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mean	IQR
14	17	Strategic thinking enables the chief technology officer to make wise and thoughtful decisions on technology investment, resource allocation, and project priorities. They can weigh the broader impact on the organization and consider potential risks and benefits.	5	4.24	1
10	18	Business acumen enables the chief technology officer to effectively manage technology budgets. They can effectively allocate resources, optimize technology expenditures, and demonstrate the return on investment of technology plans.	4	4.47	1
8	19	Business intelligence allows chief technology officer to focus on creating value for the organization. They can determine how technology can improve products, services, and processes to drive revenue growth and customer satisfaction.	5	4.59	1
10	20	Strategic thinking promotes collaboration with other executives and department heads. The chief technology officer can collaborate with different stakeholders to align technology plans with broader business objectives.	5	4.47	1
4	21	Business intelligence enables the chief technology officer to evaluate new opportunities for adoption. They can identify areas where technology can optimize processes, reduce costs, and improve overall efficiency.	5	4.65	1

Table 4.5 (Continued)

Mean Ranking	No	The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mean	IQR
2	22	Business acumen allows chief technology officer to evaluate the effectiveness of technical plans. They can use key performance indicators (KPIs) to measure results and adjust strategies accordingly.	5	4.71	1
4	23	Business acumen can help chief technology officers understand the organization's goals and objectives. With these understandings, they can adjust their technological strategies and initiatives to support and strengthen the achievement of these goals.	5	4.65	0.5
4	24	Strategic thinking includes maintaining an understanding of market trends, customer needs, and industry disruptions. The chief technology officer can use this knowledge to identify technology driven innovation opportunities that align with market demand.	5	4.65	0.5
1	25	Strategic thinking includes predicting potential risks and challenges. The chief technology officer can develop contingency plans to mitigate risks related to technology implementation, cybersecurity, and data privacy.	5	4.76	1
4	26	Business intelligence ensures that technology driven innovation is aligned with the overall business strategy of the organization. The chief technology officer can prioritize innovative efforts to provide competitive advantage and drive growth.	5	4.65	0.5
2	27	Strategic thinking includes long-term planning and envisioning the future of the organization. The chief technology officer can develop a technology roadmap that is consistent with the	5	4.71	1

Table 4.5 (Continued)

Mean Ranking	No	The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mean	IQR
		organization's long-term vision and support its development trajectory.			
8	28	Strategic thinking helps chief technology officer adopt a customer-centric approach to technology development. They can prioritize technical solutions that meet customer needs and enhance the overall customer experience.	5	4.59	1
13	29	Business acumen allows the chief technology officer to identify opportunities to gain competitive advantage through technological differentiation and innovation.	5	4.35	1
		Collaboration and team building			
5	30	Collaboration requires employees to possess adaptive leadership skills. The Chief Technical Officer must provide flexible and open feedback, adjusting their leadership style to meet the needs and preferences of different team members.	4	4.65	1
5	31	Collaboration allows chief technology officers to work closely with other executives, such as the CEO, CFO, COO, and CMO, to align technology strategies with broader business goals. By collaborating with different departments, chief technology officer ensures that technical solutions support the organization.	5	4.65	1
1	32	Technical expertise allows chief technology officer to have meaningful discussions with the technical team. They can provide guidance, guidance, and support to promote a collaborative and productive work environment.	5	4.76	1

Table 4.5 (Continued)

Mean Ranking	No	The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mean	IQR
5	33	Collaboration requires effective communication skills. The chief technology officer must communicate technical concepts and strategies in a clear and concise manner to stakeholders at all levels of the organization, including non-technical personnel.	5	4.65	0
13	34	Team building is crucial for forming and cultivating high-performance technical teams. The Chief Technical Officer is responsible for identifying and recruiting top talent, cultivating a positive work culture, and encouraging teamwork and camaraderie among team members.	5	4.59	1
2	35	Collaboration creates an environment where team members are willing to share ideas and contribute to innovation. The chief technology officer encourages and values the opinions of team members, leading to breakthroughs and creative solutions.	5	4.71	1
21	36	The Chief Technical Officer authorizes team members to assume their own roles and responsibilities. By providing autonomy and trust, chief technology officer cultivates a sense of ownership and responsibility among team members.	5	4.29	1
18	37	Collaboration and team building enable the Chief Technical Officer to guide and support the professional development of team members. This includes providing training opportunities, career development guidance, and guidance.	5	4.47	0.5

Table 4.5 (Continued)

Mean Ranking	No	The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mean	IQR
5	38	In a collaborative work environment, conflicts may arise. The Chief Technical Officer must be proficient in conflict resolution and mediation to ensure that issues are quickly and constructively resolved.	5	4.65	1.5
13	39	Collaboration and team building promote diversity and inclusiveness within the technical team. The chief technology officer ensures that different perspectives are valued and maintains an inclusive work environment.	5	4.59	1
5	40	Team building involves creating an atmosphere of open communication and trust. The chief technology officer has developed an environment where team members are willing to express their opinions and concerns.	5	4.65	1
17	41	The Chief Technical Officer recognizes and celebrates the achievements of individual team members and the entire team. Recognizing one's achievements can boost morale and motivate team members to stand out.	5	4.53	1
19	42	Collaboration and team building encourage knowledge sharing among team members. The Chief Technical Officer provides team members with the opportunity to share professional knowledge, best practices, and lessons learned.	5	4.35	1

Table 4.5 (Continued)

Mean Ranking	No	The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mean	IQR
Cultivate innovation and research and development					
19	43	The ability to acquire relevant knowledge in this field, especially cutting-edge knowledge related to the development direction of this field, through multiple channels	5	4.35	1
5	44	The ability to understand and reason about a thing by breaking it down into several parts or describing its internal connections through layers of causal relationships, thus innovating on the basis of that thing	4	4.65	1
2	45	Able to identify risks in the project and take measures to control them	4	4.71	1
13	46	Able to grasp the project from a macro perspective and determine its feasibility based on the information obtained	5	4.59	0.5
5	47	Pay attention to the operation of the project and be able to keenly observe the fluctuations in project operation	5	4.65	0.5
5	48	Creating an innovative culture can cultivate creativity, drive continuous improvement, and drive the growth and success of an organization. As a chief technology officer, establishing an innovation culture within the technical team and the entire organization is a key responsibility.	5	4.65	1

Table 4.5 (Continued)

Mean Ranking	No	The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mean	IQR
2	49	By effectively managing intellectual property and patents, the chief technology officer ensures that the organization's technological innovation is protected, leverages competitive advantages, and contributes to its long-term success in the high-tech field.	5	4.71	1
13	50	For the chief technology officer it is crucial to align research and development (R&D) with business goals to ensure that technology plans align with organizational strategic goals and contribute to their long-term success. By effectively combining research and development with business objectives, chief technology officer can drive innovation, optimize resource allocation, and maximize the value of technology investment.	5	4.59	1
		Technical expertise and vision			
1	51	In a rapidly evolving technological environment, the expertise of the chief technology officer enables them to navigate complex environments and make informed decisions. They ensure that the organization adopts the correct technology and continuously updates industry best practices.	5	4.76	1

Table 4.5 (Continued)

Mean Ranking	No	The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mean	IQR
2	52	The technical expertise of chief technology officer is the foundation of their role. It involves in-depth knowledge and understanding of various technologies, systems, and tools related to the industry and operations of the organization. This expertise enables chief technology officer to make informed decisions, design powerful technical solutions, and provide strategic guidance to other teams.	5	4.71	1
4	53	Technical expertise enables the chief technology officer to evaluate emerging technologies and assess their potential impact on the organization. They can identify trends, identify disruptive technologies, and recommend strategic investments to maintain a leading position in the competition	5	4.47	0.5
5	54	When faced with technical challenges, the expertise of the Chief Technical Officer comes into play to find effective solutions. They can solve problems, implement repair programs, and minimize disruptions to business operations.	5	4.41	0.5
3	55	The technical expertise of the chief technology officer cultivates a culture of innovation within the organization. They inspire technical teams to explore new ideas and attempt to use cutting-edge technology to drive business innovation.	5	4.59	1

Table 4.6 The result of round 3: Sustainable development strategies that high-tech enterprises need to possess

Mean Ranking	No	Sustainable development strategies that high-tech enterprises need to possess	Mdn	IQR	Mean
		Environmental Sustainability Initiative			
4	56	Promote the adoption of energy-saving technologies and practices within the organization. This includes optimizing the data center, using energy-efficient hardware, and implementing power management strategies for devices.	4	1	4.29
2	57	Explore opportunities for transitioning to renewable energy, such as solar, wind, or hydroelectric power, to power the organization's operations and reduce carbon emissions.	5	1	4.35
4	58	Prioritize the procurement of environmentally friendly IT equipment to ensure that hardware and components comply with recognized environmental standards, such as Energy Star certification.	4	1	4.29
4	59	Extend the service life of IT equipment through maintenance, refurbishment, and recycling, embracing the principles of circular economy. Promote responsible electronic waste management and collaborate with certified recycling suppliers.	4	1	4.29
12	60	Encourage the adoption of virtualization and cloud computing to optimize resource utilization and reduce the physical footprint of IT infrastructure.	4	1	4.12
4	61	Implement a system to track and measure the organization's carbon footprint. Regularly evaluate and report on carbon emissions to identify areas for improvement.	4	1	4.29

Table 4.6 (Continued)

Mean Ranking	No	Sustainable development strategies that high-tech enterprises need to possess	Mdn	IQR	Mean
10	62	Encourage sustainable practices in software development, such as optimizing code to reduce energy consumption and minimize digital waste.	4	0.5	4.18
13	63	Promote the choice of remote work and remote work to reduce carbon emissions related to commuting and promote healthier work life balance for employees.	4	1	4
1	64	Promote paperless practices within organizations by encouraging digital documents, electronic signatures, and electronic communication.	4	1	4.47
2	65	Educate employees on environmental sustainability and encourage them to actively participate in green initiatives. Carry out promotional activities and involve employees in sustainable development projects.	4	0	4.35
10	66	Optimize data center operations to reduce energy consumption and waste. Consider energy-saving cooling solutions and utilize advanced power management tools.	5	1	4.18
8	67	If applicable, implement green building practices and sustainable facility management to reduce the overall environmental impact of the organization.	4	1	4.24

Table 4.6 (Continued)

Mean Ranking	No	Sustainable development strategies that high-tech enterprises need to possess	Mdn	IQR	Mean
8	68	Strive to obtain recognized environmental certifications, such as LEED (Leadership in Energy and Environmental Design) or ISO 14001, to demonstrate the organization's commitment to sustainable development.	4	1	4.24
Social Responsibility and Moral Practice					
8	69	Collaborate with company leaders to develop a comprehensive corporate social responsibility strategy that aligns with organizational values and mission. Incorporate social and ethical considerations into technological decision-making.	4	1	4.24
3	70	Ensure that technical solutions and applications adhere to ethical standards and respect user privacy and data security. Implement strict data protection measures to protect customer information.	4	1	4.41
4	71	Advocate inclusive design practices to cater to different user groups and consider accessibility needs. Ensure that all individuals have access to and use technology products and services.	4	1	4.35

Table 4.6 (Continued)

Mean Ranking	No	Sustainable development strategies that high-tech enterprises need to possess	Mdn	IQR	Mean
2	72	Promote environmental sustainability initiatives and implement environmental practices in technology operations. This includes adopting energy-saving technologies, reducing electronic waste, and promoting sustainable IT practices.	4	1	4.47
8	73	Winning championships, diversity, and inclusivity within the technical team and the entire organization. Encourage different recruitment practices and create an inclusive work environment that values different perspectives.	4	1	4.24
7	74	Collaborate with suppliers and suppliers to ensure ethical practices throughout the entire supply chain. Prioritize cooperation with suppliers who adhere to fair labor practices and sustainable procurement.	4	1	4.29
1	75	Cultivate a responsible innovation culture where technological initiatives consider potential social and ethical impacts. Predict and address any unexpected consequences of technical solutions.	5	1	4.53
4	76	Practice transparency in technical operations and decision-making. Responsible for addressing the impact of technological initiatives on society, customers, and stakeholders.	4	1	4.35

Table 4.6 (Continued)

Mean Ranking	No	Sustainable development strategies that high-tech enterprises need to possess	Mdn	IQR	Mean
8	77	Promote the ethical use of artificial intelligence (AI) and data ethics. Develop responsible guidelines for artificial intelligence deployment and data processing, taking into account potential biases and privacy issues.	4	1	4.24
4	78	Develop and implement ethical standards and codes of conduct for the technical team. Ensure employees are aware of ethical expectations and follow best practices.	5	1	4.35
8	79	Ensure that the organization's technical operations uphold human rights and fair labor practices. Avoid engaging in projects that lead to human rights violations or unethical labor practices.	4	1	4.24
8	80	Engage with stakeholders, including customers, employees, investors, and the community, understand their concerns, and incorporate their feedback into technical strategies.	4	1	4.24
Economic sustainability and long-term feasibility					
10	81	Collaborate with business leaders to evaluate the organization's current business model and identify opportunities for improvement. Ensure consistency between technology plans and the organization's revenue generation and cost optimization strategies.	4	1	4.41

Table 4.6 (Continued)

Mean Ranking	No	Sustainable development strategies that high-tech enterprises need to possess	Mdn	IQR	Mean
2	82	Work closely with the finance team to create realistic financial plans and budgets, and strategically allocate resources in technical projects. Prioritize plans with clear paths to generate value and return on investment (ROI).	4	1	4.71
8	83	Focus on improving profitability and optimizing operating costs. Assess technology related costs and explore opportunities for cost savings through automation, process improvement, and resource optimization.	4	1	4.53
6	84	Stay up-to-date with market trends, customer preferences, and emerging technologies. Utilize market insights to guide technical decisions and ensure that the organization remains competitive and relevant.	4	1	4.59
8	85	Encourage the use of organizational technological capabilities to explore new revenue streams and business opportunities. Diversification reduces dependence on a single source of income and enhances financial stability.	5	1	4.53
6	86	Identify potential economic risks, such as market fluctuations, regulatory changes, or supply chain disruptions, and develop risk management strategies to mitigate their impact on the organization.	5	1	4.59

Table 4.6 (Continued)

Mean Ranking	No	Sustainable development strategies that high-tech enterprises need to possess	Mdn	IQR	Mean
1	87	Balancing short-term technological initiatives with long-term investment in innovation. Cultivate a culture of continuous improvement, research and development (R&D) to drive sustainable growth.	5	1	4.82
5	88	Promote agility and adaptability within the technical team to quickly respond to constantly changing market conditions and customer needs. Adopting agile methods to ensure that technical plans remain relevant and flexible.	5	1	4.65
2	89	Explore strategic partnerships and collaborations with other organizations to leverage complementary technologies and expand market reach.	5	1	4.71
2	90	Invest in talent management programs to attract and retain top technical professionals. A skilled and proactive workforce helps drive innovation and maintain long-term viability.	5	1	4.71
12	91	Embrace sustainable development initiatives and corporate social responsibility practices. Demonstrating commitment to environmental and social issues can enhance an organization's reputation and appeal to stakeholders.	5	0	4.35
10	92	Regularly monitor and evaluate the performance of technical plans based on economic goals. Use data-driven insights to make informed decisions and adjust strategies as needed.	5	0.5	4.41

Table 4.7 The result of round 3: chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises

Mean Ranking	No	chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises	Mdn	IQR	Mean
Key steps to fully utilize emerging technologies					
1	93	Conduct a comprehensive analysis of the current technological landscape, including market trends, emerging technologies, and potential disruptions. Please stay updated on the progress in various technical fields.	5	0	4.76
1	94	Coordinate technology plans with the organization's long-term strategic goals. Identify areas where emerging technologies can support business goals and create competitive advantages	5	0.5	4.76
4	95	Cultivate an innovative mindset within the technical team. Encourage creative thinking, experimentation, and willingness to explore new ideas and technologies.	5	0.5	4.71
4	96	Implement pilot projects to test and evaluate the feasibility and potential impact of emerging technologies. Use a concept validation plan to evaluate feasibility and scalability.	5	0.5	4.71
13	97	Collaborate with external partners such as startups, research institutions, and technology suppliers to gain a deeper understanding of cutting-edge technologies and explore collaboration opportunities.	4	1	4.29

Table 4.7 (Continued)

Mean Ranking	No	chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises	Mdn	IQR	Mean
11	98	Technical decisions based on data-driven insights and performance metrics. Utilize analysis and market research to support the adoption of emerging technologies.	4	1	4.35
6	99	Invest in talent acquisition and development, and establish a skilled workforce that can effectively utilize emerging technologies.	5	1	4.59
9	100	Assess the risks associated with adopting emerging technologies and develop risk management strategies. Prioritize data security and privacy considerations.	5	1	4.53
11	101	Evaluate the scalability and flexibility of emerging technologies to ensure they can meet future organizational needs and adapt to constantly changing market demands.	4	1	4.35
10	102	Continuously updating regulations and compliance requirements related to emerging technologies. Ensure that the organization complies with relevant laws and industry standards.	4	1	4.41
6	103	Develop a technology roadmap outlining the integration and deployment of emerging technologies. The plan is implemented in stages to minimize interruptions.	5	1	4.59

Table 4.7 (Continued)

Mean Ranking	No	chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises	Mdn	IQR	Mean
6	104	When implementing emerging technologies, a user centric approach should be adopted. Focusing on creating value for customers and enhancing user experience.	5	1	4.59
1	105	Continuously evaluate the impact of the adopted technology on organizational goals. Be prepared to adjust strategies based on feedback and performance results.	5	0	4.76
5	106	Utilize data visualization tools to provide insights to stakeholders in a clear and actionable format. Communicate the research results of the data analysis plan to key decision-makers to influence strategic choices.	4	1	4.35
1	107	Use predictive analysis to predict future trends, market demand, and customer behavior. Use predictive models to identify potential risks and opportunities, enabling organizations to proactively respond to challenges.	5	0.5	4.71
3	108	Implement real-time analysis function to achieve agile decision-making. Real time insight allows organizations to quickly respond to constantly changing situations.	5	1	4.65

Table 4.7 (Continued)

Mean Ranking	No	chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises	Mdn	IQR	Mean
4	109	Ensure that the data analysis process complies with ethical standards, especially in terms of data privacy and protection. Responsible and transparent use of data to build trust with customers and stakeholders.	4	1	4.41
1	110	Embrace a culture of continuous improvement in data analysis practices. Regularly review and optimize the data analysis process to improve its effectiveness.	5	0.5	4.71
2	111	Clearly and transparently communicate the fundamental principles behind change, explain how it aligns with the organization's goals, and benefit all stakeholders. Open resolution of concerns and issues, regularly providing updates on changes and progress.	5	1	4.59
5	112	Engage key stakeholders from the beginning of the change process, including employees, managers, and department heads. Seek their opinions, listen to their feedback, and incorporate their ideas into the change plan.	4	1	4.47
6	113	Develop a shared vision for change, resonate with employees, and motivate them to support the initiative. Emphasize the positive impact of change on individuals and organizations.	4	1	4.41

Table 4.7 (Continued)

Mean Ranking	No	chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises	Mdn	IQR	Mean
9	114	Identify change advocates within the organization who can advocate for change and actively influence others. Authorize change agents to lead by example and share success stories.	4	1	4.29
2	115	Provide training and development projects to help employees develop the skills needed to successfully adapt to change. Provide continuous support and resources to ensure employees feel confident in implementing change.	5	1	4.59
7	116	Acknowledging that change may be unsettling and openly and generously addressing employees' fears and concerns. Provide assurance and support throughout the entire transition process.	4	1	4.35
7	117	Identify and celebrate rapid vichief technology officerries to showcase positive results of early changes in the process. Recognize and reward individuals and teams for their contributions to the successful implementation of change.	4	1	4.35
10	118	Divide changes into smaller and manageable steps, making it easier for employees to gradually adapt. Celebrate every step of progress to build motivation and motivate employees.	4	1	4.24

Table 4.7 (Continued)

Mean Ranking	No	chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises	Mdn	IQR	Mean
1	119	As a chief technology officer, as a role model, embrace change and demonstrate a willingness to learn and adapt. Show commitment to change initiatives to motivate others to follow suit.	5	1	4.65
4	120	Continuously monitor the progress of changes and prepare to adjust methods as needed. Maintain flexibility and responsiveness to feedback and constantly changing environments.	5	1	4.53
1	121	Cultivate an open and transparent communication culture with stakeholders. Regularly provide progress on technical projects, including successes, challenges, and any changes in time or scope.	5	1	4.76
2	122	Actively listen to the concerns, feedback, and expectations of stakeholders. Show empathy and understanding, and quickly resolve any issues raised.	5	0.5	4.71
2	123	Timeline, costs, and potential outcomes of real-world technology plans. Avoid excessive commitment and insufficient delivery, as this may erode the trust of stakeholders.	5	0	4.71
2	124	Clearly define the goals and objectives of technical projects based on the overall strategy of the organization. Ensure that stakeholders have a clear understanding of the project's purpose and expected outcomes.	5	0.5	4.71

Table 4.7 (Continued)

Mean Ranking	No	chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises	Mdn	IQR	Mean
6	125	Engage stakeholders in the early stages of technology projects to gather their opinions and insights. Engaging stakeholders in the decision-making process can enhance their ownership and support.	5	1	4.53
7	126	Provide technical solutions or prototype demonstrations to stakeholders to visualize potential benefits. Provide progress reports with measurable results to demonstrate the value of the project.	5	1	4.47
9	127	Proactively identify and manage risks and issues related to technical projects. Communicate mitigation plans to stakeholders to instill confidence in project management.	4	1	4.41
11	128	Demonstrate ability and expertise in technical issues to build trust and credibility with stakeholders. Respond reliably to their concerns.	4	1	4.29
10	129	Predict conflicts and disagreements among stakeholders and constructively address these issues. Seek common ground and compromise to find the most suitable solution for the organization's interests.	4	1	4.35
7	130	Maintain continuous engagement with stakeholders throughout the entire project lifecycle. Seek their opinions at key decision points and ensure that their expectations are taken into account.	5	1	4.47

Table 4.7 (Continued)

Mean Ranking	No	chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises	Mdn	IQR	Mean
5	131	Celebrate project milestones and successes with stakeholders to strengthen their support and enthusiasm for future plans.	5	1	4.59

Table 4.8 The result of round3: Prediction of the Future Role of Chief Technology Officer

Mean Ranking	No	Prediction of the Future Role of Chief Technology Officer	Mdn	IQR	Mean
2	132	Chief technology officer will take the lead in carrying out digital transformation work, guiding organizations to adopt emerging technologies and digital processes to improve efficiency and customer experience.	5	0.5	4.71
8	133	Chief technology officer will utilize data analysis and artificial intelligence to make informed, data-driven decisions to optimize business operations and drive growth. They will be responsible for identifying valuable insights from a large dataset to gain a competitive advantage.	5	1	4.59
10	134	With the increasing prevalence of cyber threats, Chief technology officer will play a crucial role in ensuring the soundness and up-to-date nature of the organization's cybersecurity measures. They will prioritize network security risk management to protect sensitive data and intellectual property.	5	1	4.47
9	135	Chief technology officer will actively support sustainable and ethical technology practices, taking into account the environmental and social impacts of technology adoption. They will strive to achieve responsible artificial intelligence and data usage.	5	1	4.53
7	136	Chief technology officer will promote customer-centric innovation by focusing on user experience and ensuring that technological solutions meet customer needs. They will be at the forefront of developing personalized and seamless digital experiences.	5	1	4.65

Table 4.8 (Continued)

Mean Ranking	No	Prediction of the Future Role of Chief Technology Officer	Mdn	IQR	Mean
2	137	Chief technology officer will adopt agile methods and promote an adaptive culture to quickly respond to market changes and constantly changing customer needs.	5	1	4.71
2	138	Chief technology officer will work closely with other executives, including the CEO, CFO, and CMO, to align technology strategy with broader business goals.	5	1	4.71
2	139	Chief technology officer will play an important role in attracting and retaining top technical talents, ensuring that employees have the opportunity to improve their skills and continue learning.	5	1	4.71
1	140	Chief technology officer will explore partnerships, collaboration, and open innovation to create dynamic ecosystems, promote innovation, and acquire cutting-edge technologies.	5	1	4.76
2	141	Chief technology officer will address complex regulatory environments and ensure compliance with data protection and privacy regulations.	5	1	4.71

After three rounds of communication with experts, the medians of the 141 items in the third round were all greater than 3.5, and the IQR were all less than 1.5. Demonstrates expert consensus on the importance of these core competencies and strategies, consistent with the consistency required by the Delphi method.

Summary

The following table provides a comparative summary of the second and third rounds.

Table 4.9 The summary of the qualities and abilities that chief technology officers in high-tech enterprises should possess

Mean ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
Adaptability and resilience in high-tech environments					
6	1. Dealing with market fluctuations: The high-tech industry is susceptible to market fluctuations and disruptive trends. The flexibility of the chief technology officer enables them to withstand market fluctuations, positioning the organization for long-term success.				
	4	1.5	5	1	4.53
3	2. Leading through change: In a fast-paced high-tech environment, the resilience of the chief technology officer enables them to effectively lead change. They maintain a positive perspective, motivate the entire team, and unite the entire organization around common goals.				
	4	1	5	1	4.59
11	3. Dynamic technology landscape: The high-tech industry has experienced frequent technological progress and innovation. The chief technology officer must adapt to these changes and constantly update their knowledge and skills to maintain relevance and effectively lead technology initiatives.				
	5	1	4	1	4.24
8	4. Agile decision-making: In a high-tech environment, market conditions and customer needs can rapidly change. The adaptability of the chief technology officer enables them to make quick and wise decisions and quickly respond to emerging opportunities and challenges.				
	5	1	5	1	4.47

Table 4.9 (Continued)

Mean ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
1	5.Embrace subversion: The high-tech industry is easily influenced by disruptive technologies that may reshape the market. The flexibility of the chief technology officer enables them to accept interruptions and identify opportunities to utilize these technologies for the benefit of the organization.				
	4	1	5	1	4.71
14	6.Navigation uncertainty: Uncertainty is widely present in the high-tech field, such as changes in regulations, geopolitical factors, and economic fluctuations. The flexibility of the chief technology officer enables them to overcome uncertainty while maintaining a focus on the organization's long-term vision.				
	4	1.5	5	0	4.18
3	7.Rotation strategy: The adaptability of the chief technology officer enables them to shift to technology strategies when necessary. They can shift their focus based on market trends and customer needs, ensuring that technical solutions align with business goals.				
	5	1	4	1	4.59
11	8.Experimentation and Innovation: Flexibility encourages chief technology officer to cultivate a culture of experimentation and innovation within the organization. By accepting calculated risks, the chief technology officer can drive technology driven initiatives, thereby creating a competitive advantage.				
	4	1	5	1	4.24
14	9.Resolve failed issues: In the high-tech field, not all initiatives can be successful. The flexibility of the chief technology officer enables them to view failure as a learning opportunity and adjust strategies to improve future outcomes.				
	5	1	4	1	4.18

Table 4.9 (Continued)

Mean ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
3	10. Technical Implementation Challenges: Implementing new technologies may bring unforeseen challenges. The adaptability of the Chief Technical Officer enables them to adjust implementation plans and effectively overcome obstacles.				
	5	1	4	1	4.59
9	11. Talent retention and development: The high-tech field is highly competitive for top technical talents. The flexibility of the chief technology officer enables them to develop strategies to retain and cultivate the best talents, ensuring the organization's ability to innovate and grow.				
	3	1	5	1	4.35
6	12. Continuous learning: Adaptability and resilience drive chief technology officer to engage in continuous learning and professional development. Continuously understanding the latest trends and best practices can improve chief technology officer's efficiency as a technology leader.				
	5	1	4	1	4.53
2	13. Addressing data privacy and security issues: In the era of widespread digital leaks and cyber threats, addressing data privacy and security issues is crucial for chief technology officers (chief technology officers). As the custodian of technology infrastructure and data management, chief technology officer plays a crucial role in ensuring that the organization's data remains protected and complies with privacy regulations.				
	4	1	5	1	4.65

Table 4.9 (Continued)

Mean ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
10	14. Ensure safety and compliance: Having a deep understanding of network security and data protection, ensuring that the organization's technical systems and data are secure and comply with relevant regulations.				
	4	1	5	0.5	4.29
11	15. Comply with industry standards and regulations: Compliance with industry standards and regulations is a key responsibility of the chief technology officer (chief technology officer) to ensure that organizations comply with legal requirements, industry best practices, and ethical guidelines. Failure to comply with these standards may result in legal liability, reputation damage, and operational interruption.				
	4	1	4	1	4.24
Business acumen and strategic thinking					
12	16. Driving technology strategy: With their professional knowledge, chief technology officers can create and implement comprehensive technical strategies that are aligned with the overall goals of the organization. They have identified opportunities to leverage technology to gain competitive advantage, optimize processes, and drive growth				
	4	1	4	1	4.41
14	17. Decision-making: Strategic thinking enables the chief technology officer to make wise and thoughtful decisions on technology investment, resource allocation, and project priorities. They can weigh the broader impact on the organization and consider potential risks and benefits.				
	3	1	5	1	4.24

Table 4.9 (Continued)

Mean ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
10	18.Financial management: Business acumen enables the chief technology officer to effectively manage technology budgets. They can effectively allocate resources, optimize technology expenditures, and demonstrate the return on investment of technology plans.				
	4	1.5	4	1	4.47
8	19.Value creation: Business intelligence allows chief technology officer to focus on creating value for the organization. They can determine how technology can improve products, services, and processes to drive revenue growth and customer satisfaction.				
	5	1	5	1	4.59
10	20.Cross functional collaboration: Strategic thinking promotes collaboration with other executives and department heads. The chief technology officer can collaborate with different stakeholders to align technology plans with broader business objectives.				
	4	1	5	1	4.47
4	21.Opportunity assessment: Business intelligence enables the chief technology officer to evaluate new opportunities for adoption. They can identify areas where technology can optimize processes, reduce costs, and improve overall efficiency.				
	4	1.5	5	1	4.65
2	22.Performance evaluation: Business acumen allows chief technology officer to evaluate the effectiveness of technical plans. They can use key performance indicators (KPIs) to measure results and adjust strategies accordingly.				
	4	1	5	1	4.71

Table 4.9 (Continued)

Mean ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
4	23.Understand business objectives: Business acumen can help chief technology officers understand the organization's goals and objectives. With these understandings, they can adjust their technological strategies and initiatives to support and strengthen the achievement of these goals.				
	4	1	5	0.5	4.65
4	24.Market awareness: Strategic thinking includes maintaining an understanding of market trends, customer needs, and industry disruptions. The chief technology officer can use this knowledge to identify technology driven innovation opportunities that align with market demand.				
	5	1	5	0.5	4.65
1	25.Reduce risk: Strategic thinking includes predicting potential risks and challenges. The chief technology officer can develop contingency plans to mitigate risks related to technology implementation, cybersecurity, and data privacy.				
	3	1	5	1	4.76
4	26.Innovation consistency: Business intelligence ensures that technology driven innovation is aligned with the overall business strategy of the organization. The chief technology officer can prioritize innovative efforts to provide competitive advantage and drive growth.				
	5	1	5	0.5	4.65
2	27.Long term planning: Strategic thinking includes long-term planning and envisioning the future of the organization. The chief technology officer can develop a technology roadmap that is consistent with the organization's long-term vision and support its development trajectory.				
	5	1	5	1	4.71

Table 4.9 (Continued)

Mean ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
8	28.A customer-centric approach: Strategic thinking helps chief technology officer adopt a customer-centric approach to technology development. They can prioritize technical solutions that meet customer needs and enhance the overall customer experience.				
	4	1	5	1	4.59
13	29.Competitive edge: Business acumen allows the chief technology officer to identify opportunities to gain competitive advantage through technological differentiation and innovation.				
	4	1	5	1	4.35
Collaboration and team building					
5	30.Adaptive leadership: Collaboration requires employees to possess adaptive leadership skills. The Chief Technical Officer must provide flexible and open feedback, adjusting their leadership style to meet the needs and preferences of different team members.				
	4	1	4	1	4.65
5	31.Cross functional collaboration: Collaboration allows chief technology officers to work closely with other executives, such as the CEO, CFO, COO, and CMO, to align technology strategies with broader business goals. By collaborating with different departments, chief technology officer ensures that technical solutions support the organization.				
	5	1	5	1	4.65
1	32.Collaboration with technical team: Technical expertise allows chief technology officer to have meaningful discussions with the technical team. They can provide guidance, guidance, and support to promote a collaborative and productive work environment.				
	5	1	5	1	4.76

Table 4.9 (Continued)

Mean ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
5	33.Effective communication: Collaboration requires effective communication skills. The chief technology officer must communicate technical concepts and strategies in a clear and concise manner to stakeholders at all levels of the organization, including non-technical personnel.				
	5	1	5	0	4.65
13	34.Establish a high-performance team: Team building is crucial for forming and cultivating high-performance technical teams. The Chief Technical Officer is responsible for identifying and recruiting top talent, cultivating a positive work culture, and encouraging teamwork and camaraderie among team members.				
	5	1	5	1	4.59
2	35.Encourage team innovation: Collaboration creates an environment where team members are willing to share ideas and contribute to innovation. The chief technology officer encourages and values the opinions of team members, leading to breakthroughs and creative solutions.				
	5	1	5	1	4.71
21	36.Authorize team members: The Chief Technical Officer authorizes team members to assume their own roles and responsibilities. By providing autonomy and trust, chief technology officer cultivates a sense of ownership and responsibility among team members.				
	5	1	5	1	4.29
18	37.Guidance and professional development: Collaboration and team building enable the Chief Technical Officer to guide and support the professional development of team members. This includes providing training opportunities, career development guidance, and guidance.				
	5	1	5	0.5	4.47

Table 4.9 (Continued)

Mean ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
5	38.Conflict team resolution: In a collaborative work environment, conflicts may arise. The Chief Technical Officer must be proficient in conflict resolution and mediation to ensure that issues are quickly and constructively resolved.				
	4	1	5	1.5	4.65
13	39.Ensure team diversity and inclusivity: Collaboration and team building promote diversity and inclusiveness within the technical team. The chief technology officer ensures that different perspectives are valued and maintains an inclusive work environment.				
	4	1	5	1	4.59
5	40.Encourage open communication within the team: Team building involves creating an atmosphere of open communication and trust. The chief technology officer has developed an environment where team members are willing to express their opinions and concerns.				
	4	1	5	1	4.65
17	41.Commending achievements: The Chief Technical Officer recognizes and celebrates the achievements of individual team members and the entire team. Recognizing one's achievements can boost morale and motivate team members to stand out.				
	5	1.5	5	1	4.53
19	42.Promoting knowledge sharing: Collaboration and team building encourage knowledge sharing among team members. The Chief Technical Officer provides team members with the opportunity to share professional knowledge, best practices, and lessons learned.				
	4	1	5	1	4.35

Table 4.9 (Continued)

Mean ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
	Cultivate innovation and research and development				
19	43.Ability to obtain information: The ability to acquire relevant knowledge in this field, especially cutting-edge knowledge related to the development direction of this field, through multiple channels				
	5	1	5	1	4.35
5	44.Inferential innovation ability: The ability to understand and reason about a thing by breaking it down into several parts or describing its internal connections through layers of causal relationships, thus innovating on the basis of that thing				
	5	1	4	1	4.65
2	45.Project risk identification and control capabilities: Able to identify risks in the project and take measures to control them				
	5	1	4	1	4.71
13	46.Research decision-making ability: Able to grasp the project from a macro perspective and determine its feasibility based on the information obtained				
	5	1.5	5	0.5	4.59
5	47.Experimental observation ability: Pay attention to the operation of the project and be able to keenly observe the fluctuations in project operation				
	4	1	5	0.5	4.65
5	48.Creating an innovative culture: Creating an innovative culture can cultivate creativity, drive continuous improvement, and drive the growth and success of an organization. As a chief technology officer, establishing an innovation culture within the technical team and the entire organization is a key responsibility.				
	5	1	5	1	4.65

Table 4.9 (Continued)

Mean ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
2	49.Manage intellectual property and patent capabilities: By effectively managing intellectual property and patents, the chief technology officer ensures that the organization's technological innovation is protected, leverages competitive advantages, and contributes to its long-term success in the high-tech field.				
	5	1	5	1	4.71
13	50.Integrating research and development with business objectives: For the chief technology officer (chief technology officer), it is crucial to align research and development (R&D) with business goals to ensure that technology plans align with organizational strategic goals and contribute to their long-term success. By effectively combining research and development with business objectives, chief technology officer can drive innovation, optimize resource allocation, and maximize the value of technology investment.				
	5	1	5	1	4.59
	Technical expertise and vision				
1	51.Harnessing complex technological environments: In a rapidly evolving technological environment, the expertise of the chief technology officer enables them to navigate complex environments and make informed decisions. They ensure that the organization adopts the correct technology and continuously updates industry best practices.				
	4	1	5	1	4.76
2	52.Technical expertise: The technical expertise of chief technology officer is the foundation of their role. It involves in-depth knowledge and understanding of various technologies, systems, and tools related				

Table 4.10 The summary of sustainable development strategies that high-tech enterprises need to possess

Mean Ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
	Environmental Sustainability Initiative				
4	56. Energy efficiency: Promote the adoption of energy-saving technologies and practices within the organization. This includes optimizing the data center, using energy-efficient hardware, and implementing power management strategies for devices.				
	4	1.5	4	1	4.29
2	57. Renewable energy: Explore opportunities for transitioning to renewable energy, such as solar, wind, or hydroelectric power, to power the organization's operations and reduce carbon emissions.				
	4	2	5	1	4.35
4	58. Green IT procurement: Prioritize the procurement of environmentally friendly IT equipment to ensure that hardware and components comply with recognized environmental standards, such as Energy Star certification.				
	4	2	4	1	4.29
4	59. Circular economy practice: Extend the service life of IT equipment through maintenance, refurbishment, and recycling, embracing the principles of circular economy. Promote responsible electronic waste management and collaborate with certified recycling suppliers.				
	4	2	4	1	4.29
12	60. Virtualization and cloud computing: Encourage the adoption of virtualization and cloud computing to optimize resource utilization and reduce the physical footprint of IT infrastructure.				
	4	1.5	4	1	4.12

Table 4.10 (Continued)

Mean Ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
4	61. Carbon footprint tracking: Implement a system to track and measure the organization's carbon footprint. Regularly evaluate and report on carbon emissions to identify areas for improvement.				
	4	2	4	1	4.29
10	62. Sustainable software development: Encourage sustainable practices in software development, such as optimizing code to reduce energy consumption and minimize digital waste.				
	4	1	4	0.5	4.18
13	63. Remote work and remote work: Promote the choice of remote work and remote work to reduce carbon emissions related to commuting and promote healthier work life balance for employees.				
	4	1	4	1	4
1	64. Paperless Initiative: Promote paperless practices within organizations by encouraging digital documents, electronic signatures, and electronic communication.				
	5	1	4	1	4.47
2	65. Employee education and participation: Educate employees on environmental sustainability and encourage them to actively participate in green initiatives. Carry out promotional activities and involve employees in sustainable development projects.				
	4	1.5	4	0	4.35
10	66. Green data center: Optimize data center operations to reduce energy consumption and waste. Consider energy-saving cooling solutions and utilize advanced power management tools.				
	4	2	5	1	4.18

Table 4.10 (Continued)

Mean Ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
8	67.Green building and facility management: If applicable, implement green building practices and sustainable facility management to reduce the overall environmental impact of the organization.				
	4	2	4	1	4.24
8	68.Environmental certification: Strive to obtain recognized environmental certifications, such as LEED (Leadership in Energy and Environmental Design) or ISO 14001, to demonstrate the organization's commitment to sustainable development.				
	4	2	4	1	4.24
Social Responsibility and Moral Practice					
8	69.Corporate social responsibility (CSR) strategy: Collaborate with company leaders to develop a comprehensive corporate social responsibility strategy that aligns with organizational values and mission. Incorporate social and ethical considerations into technological decision-making.				
	4	1	4	1	4.24
3	70.Ethical technology use: Ensure that technical solutions and applications adhere to ethical standards and respect user privacy and data security. Implement strict data protection measures to protect customer information.				
	4	1	4	1	4.41
4	71.Inclusive design: Advocate inclusive design practices to cater to different user groups and consider accessibility needs. Ensure that all individuals have access to and use technology products and services.				
	4	1	4	1	4.35

Table 4.10 (Continued)

Mean Ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
2	72.Environmental sustainability: Promote environmental sustainability initiatives and implement environmental practices in technology operations. This includes adopting energy-saving technologies, reducing electronic waste, and promoting sustainable IT practices.				
	4	1	4	1	4.47
8	73.Diversity and inclusion: Winning championships, diversity, and inclusivity within the technical team and the entire organization. Encourage different recruitment practices and create an inclusive work environment that values different perspectives.				
	4	1	4	1	4.24
7	74.Ethical supply chain: Collaborate with suppliers and suppliers to ensure ethical practices throughout the entire supply chain. Prioritize cooperation with suppliers who adhere to fair labor practices and sustainable procurement.				
	5	1	4	1	4.29
1	75.Responsible innovation: Cultivate a responsible innovation culture where technological initiatives consider potential social and ethical impacts. Predict and address any unexpected consequences of technical solutions.				
	5	1	5	1	4.53
4	76.Transparency and accountability: Practice transparency in technical operations and decision-making. Responsible for addressing the impact of technological initiatives on society, customers, and stakeholders.				
	4	1	4	1	4.35

Table 4.10 (Continued)

Mean Ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
8	77.Ethical artificial intelligence and data ethics: Promote the ethical use of artificial intelligence (AI) and data ethics. Develop responsible guidelines for artificial intelligence deployment and data processing, taking into account potential biases and privacy issues.				
	4	1	4	1	4.24
4	78.Ethical standards and code of conduct: Develop and implement ethical standards and codes of conduct for the technical team. Ensure employees are aware of ethical expectations and follow best practices.				
	4	1	5	1	4.35
8	79.Human rights and labor practices: Ensure that the organization's technical operations uphold human rights and fair labor practices. Avoid engaging in projects that lead to human rights violations or unethical labor practices.				
	4	2	4	1	4.24
8	80.Stakeholder engagement: Engage with stakeholders, including customers, employees, investors, and the community, understand their concerns, and incorporate their feedback into technical strategies.				
	4	1	4	1	4.24
Economic sustainability and long-term feasibility					
10	81.Business model assessment: Collaborate with business leaders to evaluate the organization's current business model and identify opportunities for improvement. Ensure consistency between technology plans and the organization's revenue generation and cost optimization strategies.				
	4	1	4	1	4.41

Table 4.10 (Continued)

Mean Ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
2	82.Financial planning and budgeting: Work closely with the finance team to create realistic financial plans and budgets, and strategically allocate resources in technical projects. Prioritize plans with clear paths to generate value and return on investment (ROI).				
	4	1	4	1	4.71
8	83.Profitability and cost control: Focus on improving profitability and optimizing operating costs. Assess technology related costs and explore opportunities for cost savings through automation, process improvement, and resource optimization.				
	5	1	4	1	4.53
6	84.Market analysis and trends: Stay up-to-date with market trends, customer preferences, and emerging technologies. Utilize market insights to guide technical decisions and ensure that the organization remains competitive and relevant.				
	4	1	4	1	4.59
8	85.Diversification of income streams: Encourage the use of organizational technological capabilities to explore new revenue streams and business opportunities. Diversification reduces dependence on a single source of income and enhances financial stability.				
	4	1.5	5	1	4.53
6	86.Risk management: Identify potential economic risks, such as market fluctuations, regulatory changes, or supply chain disruptions, and develop risk management strategies to mitigate their impact on the organization.				
	4	1	5	1	4.59

Table 4.10 (Continued)

Mean Ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
1	87.Long term innovation investment: Balancing short-term technological initiatives with long-term investment in innovation. Cultivate a culture of continuous improvement, research and development (R&D) to drive sustainable growth.				
	4	1.5	5	1	4.82
5	88.Agility and adaptability: Promote agility and adaptability within the technical team to quickly respond to constantly changing market conditions and customer needs. Adopting agile methods to ensure that technical plans remain relevant and flexible.				
	4	1	5	1	4.65
2	89.Strategic partnership: Explore strategic partnerships and collaborations with other organizations to leverage complementary technologies and expand market reach.				
	4	1	5	1	4.71
2	90.Talent management and retention: Invest in talent management programs to attract and retain top technical professionals. A skilled and proactive workforce helps drive innovation and maintain long-term viability.				
	5	1	5	1	4.71
12	91.Environmental and social responsibility: Embrace sustainable development initiatives and corporate social responsibility practices. Demonstrating commitment to environmental and social issues can enhance an organization's reputation and appeal to stakeholders.				
	4	1	5	0	4.35
10	92.Continuous monitoring and evaluation: Regularly monitor and evaluate the performance of technical plans based on economic goals. Use data-driven insights to make informed decisions and adjust strategies as needed.				
	4	1	5	0.5	4.41

Table 4.10 (Continued)

Mean Ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
	Key steps to fully utilize emerging technologies				
1	93. Technical landscape analysis: Conduct a comprehensive analysis of the current technological landscape, including market trends, emerging technologies, and potential disruptions. Please stay updated on the progress in various technical fields.				
	5	1	5	0	4.76
1	94. Strategic coordination: Coordinate technology plans with the organization's long-term strategic goals. Identify areas where emerging technologies can support business goals and create competitive advantages				
	3	1	5	0.5	4.76
4	95. Innovative mindset: Cultivate an innovative mindset within the technical team. Encourage creative thinking, experimentation, and willingness to explore new ideas and technologies.				
	5	1	5	0.5	4.71
4	96. Pilot project: Implement pilot projects to test and evaluate the feasibility and potential impact of emerging technologies. Use a concept validation plan to evaluate feasibility and scalability.				
	4	1	5	0.5	4.71
13	97. Collaboration and partnership: Collaborate with external partners such as startups, research institutions, and technology suppliers to gain a deeper understanding of cutting-edge technologies and explore collaboration opportunities.				
	4	2	4	1	4.29
11	98. Data-driven decision-making: Technical decisions based on data-driven insights and performance metrics. Utilize analysis and market research to support the adoption of emerging technologies.				
	4	1	4	1	4.35

Table 4.10 (Continued)

Mean Ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
6	99.Talent acquisition and development: Invest in talent acquisition and development, and establish a skilled workforce that can effectively utilize emerging technologies.				
	5	1	5	1	4.59
9	100.Risk and security management: Assess the risks associated with adopting emerging technologies and develop risk management strategies. Prioritize data security and privacy considerations.				
	4	1	5	1	4.53
11	101.Scalability and flexibility: Evaluate the scalability and flexibility of emerging technologies to ensure they can meet future organizational needs and adapt to constantly changing market demands.				
	4	1	4	1	4.35
10	102.Regulatory compliance: Continuously updating regulations and compliance requirements related to emerging technologies. Ensure that the organization complies with relevant laws and industry standards.				
	4	1	4	1	4.41
6	103.Technical roadmap: Develop a technology roadmap outlining the integration and deployment of emerging technologies. The plan is implemented in stages to minimize interruptions.				
	5	1	5	1	4.59
6	104.User centric approach: When implementing emerging technologies, a user centric approach should be adopted. Focusing on creating value for customers and enhancing user experience.				
	5	1	5	1	4.59

Table 4.10 (Continued)

Mean Ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
1	105.Continuous evaluation and improvement: Continuously evaluate the impact of the adopted technology on organizational goals. Be prepared to adjust strategies based on feedback and performance results.				
	5	1	5	0	4.76
	Key steps to fully utilize data analysis and decision-making				
5	106.Visualization and communication: Utilize data visualization tools to provide insights to stakeholders in a clear and actionable format. Communicate the research results of the data analysis plan to key decision-makers to influence strategic choices.				
	4	2	4	1	4.35
1	107.Predictive analysis for prediction: Use predictive analysis to predict future trends, market demand, and customer behavior. Use predictive models to identify potential risks and opportunities, enabling organizations to proactively respond to challenges.				
	4	1	5	0.5	4.71
3	108.Real time analysis of agility: Implement real-time analysis function to achieve agile decision-making. Real time insight allows organizations to quickly respond to constantly changing situations.				
	4	1	5	1	4.65
4	109.Ethical considerations: Ensure that the data analysis process complies with ethical standards, especially in terms of data privacy and protection. Responsible and transparent use of data to build trust with customers and stakeholders.				
	4	2	4	1	4.41

Table 4.10 (Continued)

Mean Ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
1	110.Continuous improvement: Embrace a culture of continuous improvement in data analysis practices. Regularly review and optimize the data analysis process to improve its effectiveness.				
	4	1	5	0.5	4.71
	Strategies to overcome the resistance of sustainable reform in enterprises				
2	111.Effective communication: Clearly and transparently communicate the fundamental principles behind change, explain how it aligns with the organization's goals, and benefit all stakeholders. Open resolution of concerns and issues, regularly providing updates on changes and progress.				
	4	1	5	1	4.59
5	112.Early engagement with stakeholders: Engage key stakeholders from the beginning of the change process, including employees, managers, and department heads. Seek their opinions, listen to their feedback, and incorporate their ideas into the change plan.				
	4	1	4	1	4.47
6	113.Create a shared vision: Develop a shared vision for change, resonate with employees, and motivate them to support the initiative. Emphasize the positive impact of change on individuals and organizations.				
	4	1	4	1	4.41
9	114.Authorize change agents: Identify change advocates within the organization who can advocate for change and actively influence others. Authorize change agents to lead by example and share success stories.				
	4	1.5	4	1	4.29

Table 4.10 (Continued)

Mean Ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
2	115.Provide training and support: Provide training and development projects to help employees develop the skills needed to successfully adapt to change. Provide continuous support and resources to ensure employees feel confident in implementing change.				
	5	1	5	1	4.59
7	116.Addressing Fear and Uncertainty: Acknowledging that change may be unsettling and openly and generously addressing employees' fears and concerns. Provide assurance and support throughout the entire transition process.				
	4	2	4	1	4.35
7	117.Celebrate Rapid Victory: Identify and celebrate rapid victories to showcase positive results of early changes in the process. Recognize and reward individuals and teams for their contributions to the successful implementation of change.				
	4	1.5	4	1	4.35
10	118.Break down changes into manageable steps: Divide changes into smaller and manageable steps, making it easier for employees to gradually adapt. Celebrate every step of progress to build motivation and motivate employees.				
	4	1	4	1	4.24
1	119.Lead by example: As a chief technology officer, as a role model, embrace change and demonstrate a willingness to learn and adapt. Show commitment to change initiatives to motivate others to follow suit.				
	5	1	5	1	4.65

Table 4.10 (Continued)

Mean Ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
4	120.Monitoring and adjustment: Continuously monitor the progress of changes and prepare to adjust methods as needed. Maintain flexibility and responsiveness to feedback and constantly changing environments.				
	4	1	5	1	4.53
Strategies for managing stakeholder expectations					
1	121.Open and transparent communication: Cultivate an open and transparent communication culture with stakeholders. Regularly provide progress on technical projects, including successes, challenges, and any changes in time or scope.				
	5	1	5	1	4.76
2	122.Actively listening: Actively listen to the concerns, feedback, and expectations of stakeholders. Show empathy and understanding, and quickly resolve any issues raised.				
	5	1	5	0.5	4.71
2	123.Set realistic expectations: Timeline, costs, and potential outcomes of real-world technology plans. Avoid excessive commitment and insufficient delivery, as this may erode the trust of stakeholders.				
	5	1	5	0	4.71
2	124.Establish clear goals and objectives: Clearly define the goals and objectives of technical projects based on the overall strategy of the organization. Ensure that stakeholders have a clear understanding of the project's purpose and expected outcomes.				
	4	1	5	0.5	4.71
6	125.Engage stakeholders as early as possible: Engage stakeholders in the early stages of technology projects to gather their opinions and insights. Engaging stakeholders in the decision-making process can enhance their ownership and support.				
	4	1	5	1	4.53

Table 4.10 (Continued)

Mean Ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
7	126.Provide demonstrations and progress reports: Provide technical solutions or prototype demonstrations to stakeholders to visualize potential benefits. Provide progress reports with measurable results to demonstrate the value of the project.				
	4	1	5	1	4.47
9	127.Manage risks and issues: Proactively identify and manage risks and issues related to technical projects. Communicate mitigation plans to stakeholders to instill confidence in project management.				
	4	1	4	1	4.41
11	128.Building trust and credibility: Demonstrate ability and expertise in technical issues to build trust and credibility with stakeholders. Respond reliably to their concerns.				
	4	1	4	1	4.29
10	129.Resolve conflicts and differences of opinion: Predict conflicts and disagreements among stakeholders and constructively address these issues. Seek common ground and compromise to find the most suitable solution for the organization's interests.				
	4	1	4	1	4.35
7	130.Continuous engagement: Maintain continuous engagement with stakeholders throughout the entire project lifecycle. Seek their opinions at key decision points and ensure that their expectations are taken into account.				
	3	1	5	1	4.47
5	131.Celebrate achievements: Celebrate project milestones and successes with stakeholders to strengthen their support and enthusiasm for future plans.				
	4	1	5	1	4.59

Table 4.11 The summary of prediction of the future role of chief technology officer

Mean Ranking	Round 2		Round 3		
	Mdn	IQR	Mdn	IQR	Mean
2	132.Focus on digital transformation: chief technology officer will take the lead in carrying out digital transformation work, guiding organizations to adopt emerging technologies and digital processes to improve efficiency and customer experience.				
	5	1.5	5	0.5	4.71
8	133.Data-driven decision-making: chief technology officer will utilize data analysis and artificial intelligence to make informed, data-driven decisions to optimize business operations and drive growth. They will be responsible for identifying valuable insights from a large dataset to gain a competitive advantage.				
	4	1	5	1	4.59
10	134.Leading position in cybersecurity: With the increasing prevalence of cyber threats, chief technology officer will play a crucial role in ensuring the soundness and up-to-date nature of the organization's cybersecurity measures. They will prioritize network security risk management to protect sensitive data and intellectual property.				
	5	1.5	5	1	4.47
9	135.Sustainability and ethical technology adoption: chief technology officer will actively support sustainable and ethical technology practices, taking into account the environmental and social impacts of technology adoption. They will strive to achieve responsible artificial intelligence and data usage.				
	4	2	5	1	4.53
7	136.Customer centric innovation: chief technology officer will promote customer-centric innovation by focusing on user experience and ensuring that technological solutions meet customer needs. They will				

Chapter 5

Conclusion Discussion and Recommendations

Conclusion

The objective of the research are:

Leadership for sustainable growth of high-tech enterprises in Guangxi Province

This article is based on the Delphi expert consultation method to study Leadership for sustainable growth of high-tech enterprises in Guangxi Province, after three rounds of expert consultation. Finally, through verification, the results are consistent and meet the requirements.

The final model of Leadership for sustainable growth of high-tech enterprises in Guangxi Province has four parts, with a total of 14 main elements and 141 ITEMS.

The first part is that chief technology officers in high-tech enterprises should possess, with a total of 6 elements and 55 ITEMS. We can know from these results. The qualities and abilities required by chief technology officers in high-tech enterprises are multifaceted and essential for navigating the dynamic and challenging landscape of the technology industry. Through the analysis of Rounds 1, 2, and 3, it becomes evident that adaptability and resilience are paramount traits for chief technology officers, enabling them to thrive amidst market fluctuations, lead through change, and embrace disruptive technologies. Additionally, the role of chief technology officers extends beyond technical expertise to encompass strategic thinking, collaboration, and innovation cultivation. Addressing regulatory challenges and fostering a customer-centric approach are equally critical aspects of the chief technology officer role, ensuring compliance and enhancing user satisfaction. By synthesizing these qualities and abilities, chief technology officers can effectively drive sustainable growth and success for high-tech enterprises in an ever-evolving landscape.

The second part is Sustainable development strategies that high-tech enterprises need to possess. There are 3 elements in total, 37 items. The results shed light on the critical strategies that high-tech enterprises must adopt to ensure

sustainable development. The multifaceted approach encompassing environmental sustainability, social responsibility, and economic feasibility highlights the intricate balance required for long-term success. As technology evolves, organizations are compelled to not only innovate but also integrate practices that minimize environmental impact, uphold social values, and ensure economic resilience. The synthesis of these sustainable strategies forms the foundation for a holistic and responsible approach to technological leadership in the high-tech sector. High-tech enterprises that embrace and implement these strategies are poised to thrive in a future where sustainable development is intrinsic to success.

The third part is chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises, with a total of 4 elements and 38 items. The result outlines crucial chief technology officer strategies aimed at fostering sustainable growth within high-tech enterprises. These strategies encompass key steps to fully utilize emerging technologies, maximize the potential of data analysis and decision-making, overcome resistance to sustainable reform, and effectively manage stakeholder expectations. The comprehensive approach underscores the pivotal role of technology leadership in steering organizations toward sustainable success in a rapidly evolving technological landscape.

The fourth part is Prediction of the Future Role of chief technology officer, with a total of 1 element and 10 items. The predictive analysis of the future role of chief technology officers reveals a comprehensive evolution towards a multi-faceted leadership role, deeply integrated into every aspect of organizational strategy and operation. From driving digital transformation and making data-driven decisions to leading in cybersecurity, promoting sustainability, and focusing on customer-centric innovations, the role of the chief technology officer is expanding beyond traditional boundaries. This evolution reflects the increasing importance of technology in achieving competitive advantage, operational excellence, and sustainable growth in the digital age.

Discussion

The findings about 14 elements.

1. This element about technical expertise and vision is consistent with what Northouse, P. G. (2021). said details various leadership theories and emphasizes the importance of leaders' technological expertise and vision. Technological expertise and a clear vision are key factors in effective leadership, helping leaders identify and exploit technological opportunities.

2. This element about business acumen and strategic thinking is consistent with what Kane (2021). discussed strategies for companies to lead transformation in uncertain times, particularly emphasizing the importance of business acumen and strategic thinking in identifying market opportunities and developing long-term plans.

3. This element about collaboration and team building is consistent with what Gibson (2021). discussed how to build and enhance team collaboration and resilience through leadership, emphasizing that in an effective team, collaboration and team building are the key to ensuring project success and organizational resilience.

4. This element about adaptability and resilience in high-tech environments is consistent with what McKinsey & Company. (2021) analyzes how companies can remain competitive through rapid adaptability and resilience in a high-tech environment, emphasizing the importance of responding quickly to market changes and technological advances.

5. This element about cultivate innovation and research and development is consistent with what Goncalves, (2021) provides guidance on how internal entrepreneurs can promote innovation and R&D. It discusses how to stimulate the innovation potential of enterprises through internal innovation culture and resource allocation.

6. This element about addressing regulatory and compliance challenges is consistent with what Biswas (2020) discusses the regulatory compliance and compliance challenges in the pharmaceutical industry and provides relevant solutions. It emphasizes how to effectively manage regulations and compliance requirements in a highly regulated industry.

7. This element about environmental sustainability initiative is consistent with what Gartner (2023) lists the top strategic technology trends for 2024 and

highlights how to implement environmental sustainability initiatives. It explores how companies can achieve environmental sustainability through technological innovation.

8. This element about social responsibility and moral practice is consistent with what Deloitte (2022) explores global human capital trends, especially corporate performance in social responsibility and ethical practices, and emphasizes the importance of companies fulfilling their social responsibilities and maintaining ethical standards.

9. This element about economic sustainability and long-term feasibility is consistent with what Girotra (2021) explains how to achieve economic sustainability and long-term viability through risk-driven business models. It explores the key factors that companies need to consider when formulating long-term strategies.

10. This element about key steps to fully utilize emerging technologies is consistent with what Deloitte (2021) analyzes the key technology trends and key steps to lead enterprises in the post-digital era and utilize emerging technologies, and provides strategies for enterprises to effectively adopt and integrate new technologies.

11. This element about key steps to fully utilize data analysis and decision-making is consistent with what Harvard (2022) provides a CEO's guide to competing with artificial intelligence, highlighting the key steps to fully leverage data analysis and decision making. It explores the importance of data-driven decision making in corporate strategy

12. This element about strategies to overcome the resistance of sustainable reform in enterprises is consistent with what McKinsey & Company. (2023) explores how to overcome resistance to sustainable change in a hybrid work environment through collaboration and team building, and highlights the importance of change management and stakeholder engagement.

13. This element about strategies for managing stakeholder expectations is consistent with what Barsh (2020) discusses the relationship between leadership and innovation, provides strategies for managing stakeholder expectations, and emphasizes the role of transparent communication and effective expectation management in corporate innovation.

14. This element about prediction of the Future Role of CTO is consistent with what McKinsey & Company. (2022) analyzes the changing role of the Chief Technology Officer (CTO) in future enterprises and predicts the importance and development trends of the CTO in technology strategy, innovation promotion and technology team leadership.

Recommendations

Several recommendations can be proposed to enhance Leadership for sustainable growth of high-tech enterprises in Guangxi Province

Invest in Continuous Learning: Encourage chief technology officers to prioritize continuous learning and professional development to stay abreast of emerging technologies and industry trends.

Foster Collaboration: Promote a culture of collaboration and open communication within the organization, enabling chief technology officers to work effectively with cross-functional teams and senior executives.

Embrace Innovation: Create an environment that fosters innovation and experimentation, empowering chief technology officers to drive technological advancements and create value for the organization.

Prioritize Regulatory Compliance: Provide support and resources to ensure that chief technology officers can effectively address regulatory challenges and uphold data privacy and security standards.

Develop Leadership Skills: Offer leadership development programs to enhance chief technology officers' adaptive leadership, conflict resolution, and talent management abilities.

Encourage Diversity and Inclusion: Recognize the importance of diversity and inclusion in driving innovation and promoting a more equitable work environment.

By implementing these recommendations, high-tech enterprises can empower their chief technology officers to navigate complex challenges, drive sustainable growth, and position the organization for long-term success in the competitive technology landscape.

Integrated Sustainability Policies: Develop integrated sustainability policies that align environmental, social, and economic objectives. Ensure these policies are embedded in organizational culture and decision-making processes.

Technological Innovation for Sustainability: Foster a culture of innovation that prioritizes sustainable practices in technological development. Encourage the use of technology to address environmental challenges and contribute positively to society.

Employee Engagement: Implement comprehensive employee engagement programs focusing on sustainability awareness and active participation in green initiatives. Employees should be champions for sustainability within the organization.

Continuous Monitoring and Evaluation: Establish robust monitoring and evaluation mechanisms to assess the impact of sustainable development strategies. Utilize data-driven insights to refine and enhance these strategies over time.

Strategic Partnerships: Explore strategic partnerships and collaborations with organizations that share similar sustainability goals. Leverage partnerships to access complementary technologies and expand market reach.

Talent Management: Prioritize talent management and retention strategies to attract and retain skilled professionals. A proactive and diverse workforce is integral to driving innovation and ensuring long-term viability.

Education and Training: Invest in education and training programs to enhance employee skills in areas such as ethical technology use, environmental sustainability, and economic feasibility. Equip employees with the knowledge and tools to contribute meaningfully to sustainable development.

Stakeholder Engagement: Actively engage with stakeholders, including customers, employees, investors, and the community. Understand their concerns and incorporate their feedback into the development of sustainable strategies.

Certifications and Recognitions: Strive to obtain recognized environmental certifications to showcase the organization's commitment to sustainability. Seek industry recognitions for ethical practices and innovation.

Adaptive Leadership: Cultivate adaptive leadership within the technical team to respond quickly to changing market conditions and customer needs. Adopt agile methods to ensure that technical plans remain relevant and flexible.

Implementing these recommendations will position high-tech enterprises on a trajectory of sustainable growth, ethical leadership, and long-term viability in an ever-evolving technological landscape.

Future Research

The research identifies and analyzes key leadership factors influencing the sustainable development of high-tech enterprises, culminating in a proposed leadership model aimed at fostering their sustained growth. The study explores avenues for promoting the development of high-tech industries through enterprise efforts, contributing to China's modernization goals. Through deeper insights into high-tech enterprise leadership, this research seeks to provide valuable guidance for nurturing leaders capable of steering enterprises through future challenges. In subsequent studies, it can be extended in 4 aspects:

1. Relationship Between CTO Leadership and Innovation Performance

Research Direction: Explore how the leadership of CTOs affects innovation performance, particularly the speed, quality, and success rate of commercialization.

2. CTO Leadership and Corporate Sustainable Development

Research Direction: Investigate the role of CTOs in promoting corporate sustainable development, including the impact on environmental, social, and governance (ESG) factors.

3. CTO Leadership Development Models

Research Direction: Study suitable CTO leadership development models for high-technology enterprises in Guangxi Province, exploring how effective CTOs can be cultivated through training, mentorship, and career development paths.

4. Synergy Between CTO and Other Executive Team Members

Research Direction: Research the synergy between the CTO and other executive team members such as the CEO and COO, and explore how team leadership collectively promotes sustainable growth.

These research directions not only help to understand the key role of CTOs in high-technology enterprises but also provide specific leadership development and management strategies for practical application in businesses.

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Appendices

Appendix A
List of Specialists and Letters of Specialists Invitation
for IOC Verification

List of experts to validate research instruments

1. Prof. Lyu Yushen President of Gulf of Tonkin Development
Institute
2. Dr. Yin Renzhen Deputy Director of the High tech
Department, Guangxi Science and Technology
Department
3. Prof . Dr. Wei Tie Director of Business Management Department of
Business School, Guangxi University
4. Prof . Dr. Huang gang Dean of Financial innovation Development
Research Institute, ASEAN College, Guangxi
University for Nationalities
5. Prof . Dr. Yang Shixin Director of Audit Department, School of
Accounting and Auditing, Guangxi University of
Finance and Economics

List of experts invited to conduct questionnaire survey

- | | | |
|-----|--------------------------------------|--|
| 1. | Senior Engineer
Mr.Huang Weichang | Baise Mineral Development Investment Co., Ltd. |
| 2. | Senior Engineer
Mr.Yin Xianbo | GuangxiBaiseIndustrial Investment and Mining Development Co., Ltd. |
| 3. | Senior Engineer
Mr.Xu Yangzhi | Guangxi Debao Copper Mine Co., Ltd. |
| 4. | Senior Engineer
Mr.Guo Xiufeng | Guangxi Zhongxin Mining Co., Ltd. |
| 5. | Senior Engineer
Mrs.Lu Kailing | Liuzhou Liangmianzhen Co., Ltd. |
| 6. | Senior Engineer
Mr.Chen Guozhuang | Baise Xinshan Development Investment Co., Ltd. |
| 7. | Senior Engineer
Dr.Huang Shiyong | GuangxiZhuang Autonomous RegionChemical industryResearch Institute |
| 8. | Senior engineer
Mr.Deng Jiazun | Liuzhou Jinyuan Machinery Manufacturing Co., Ltd. |
| 9. | Senior Engineer
Dr.Ren Yue Lu | Guangxi Nannan Aluminum Processing Co., Ltd. |
| 10. | Senior Engineer
Mrs.Guan Jing | SAIC-GM-WulingAutomobile Co., Ltd. Technical Center |
| 11. | Senior Engineer
Mr.Li Linsheng | Guangxi ASEAN Technology Transfer Center |

12. Professor
Mr.Lu Guijun
Guangxi Institute of Science and
Technology Information
13. Senior Engineer
Mr.Tang Yongjun
Guangxi Yuchai Special Purpose Vehicle
Co., Ltd. Technology Center
14. Senior Engineer
Mr.Chen Lin
Guangxi Fengrui Information Technology
Services Co., Ltd.
15. Senior Engineer
Mr.Wang Zhixing
Guangxi Dongchuang Big Data Co., Ltd.
16. Associate Professor
Dr.Gao Bin
Guangxi University for Nationalities
17. Senior engineer
Mr.Li Jiashen
Pinglu Canal Group Co., Ltd.

Appendix B
Official Letter

Ref. No. MHESI 0643.14/ 174



Graduate School
BansomdejchaoprayaRajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

March 2023

RE: Invitation to validate research instrument

Dear Prof.Lyu Yushen

Mr. Lyu Gaizhi is a graduate student in Doctor of Philosophy in Technology and Innovation Management Program at Bansomdejchaopraya Rajabhat University. He is undertaking research entitle “Leadership for sustainable growth of high tech Enterprises”.

The thesis adversity committee has considered that you are an expert in this topic.Your recommendations would be useful for further improvement of this research instrument.

With your expertise, We would like to ask your permission to validate the attached research instrument. We would like to avail ourselves of this opportunity to express our sincere thanks and appreciation for your help.

Sincerely,

A handwritten signature in blue ink, appearing to read 'A. Asavarutpokin'.

(Assistant Professor Akaranun Asavarutpokin)
Dean of Graduate School

BansomejchaoprayaRajabhat University

Tel. (662) 4737000

www.bsru.ac.th

E-mail:grad@bsruac.th

List of experts

1. Prof .Lyu Yushen President of Gulf of Tonkin Development
Institute
2. Dr. Yin Renzhen Deputy Director of the High tech
Department, Guangxi Science and
Technology Department
3. Prof . Dr. Wei Tie Director of Business Management
Department of Business School, Guangxi
University
4. Prof . Dr. Huang gang Dean of Financial innovation Development
Research Institute, ASEAN College, Guangxi
University for Nationalities
5. Prof . Dr. Yang Shixin Director of Audit Department, School of
Accounting and Auditing, Guangxi University
of Finance and Economics

Ref. No. MHESI 0643.14/ 619



Graduate School
BansomdejchaoprayaRajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

July 2023

Subject Evaluate the consistency of elements of “Leadership for Sustainable Growth of High-tech Enterprises” with EDFR Expert Interview

Dear Mr. Li Jiashen

Attached Validation sheets

Mr. Lyu Gaizhi is a graduate student in Doctor of Philosophy in Technology and Innovation Management Program at Bansomdejchaopraya Rajabhat University. He is undertaking research entitle “Leadership for sustainable growth of high tech Enterprises” There is a thesis advisory committee as follows:

1. Assoc. Prof. Dr. Pong Horadal Major advisor
2. Asst. Prof. Dr. Kanakorn Sawangcharoen Co-advisor
3. Assoc. Prof. Dr Sombat Teekasap Co-advisor

In this regard, the thesis advisory committee has considered that you are an expert in this topic. Your recommendations would be useful for further improvement of this research instrument. Therefore, permission was requested to allow the students to take the evaluation, and set a date and time for students at your convenience.

We would like to avail ourselves of this opportunity to express our sincere thanks and appreciation for your help.

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean of Graduate School

BansomejchaoprayaRajabhat University
Tel. (662) 4737000
www.bsru.ac.th
E-mail:grad@bsru.ac.th

List of experts

1. Senior Engineer
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Baise Mineral Development Investment Co., Ltd.
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SAIC-GM-Wuling Automobile Co., Ltd. Technical Center
11. Senior Engineer
Mr.Li Linsheng
Guangxi ASEAN Technology Transfer Center

- | | | |
|-----|------------------------------------|---|
| 12. | Professor
Mr.Lu Guijun | Guangxi Institute of Science and Technology
Information |
| 13. | Senior Engineer
Mr.Tang Yongjun | Guangxi Yuchai Special Purpose Vehicle Co.,
Ltd. Technology Center |
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Appendix C

Research Instrument

Round 1 Questionnaire

Round 2 Questionnaire

Round 3 Questionnaire

Expert Interview (EDFR Round 1)

Leadership for sustainable growth of high-tech enterprises in Guangxi Province

Clarification

This interview is intended as a tool for interviewing qualified personnel. The Round1 of Leadership for sustainable growth of high-tech enterprises in Guangxi Province.

Your interview will help to create a questionnaire about the Leadership for sustainable growth of high-tech enterprises in Guangxi Province.

The interview consists of two parts:

Part 1: Information about the identity of qualified personnel.

Part 2: Interview questions about Leadership for sustainable growth of high-tech enterprises in Guangxi Province

Thank you for taking the time to fill in this questionnaire. The purpose of this questionnaire is to conduct a preliminary screening of the evaluation index system for the leadership of high-tech enterprises, hoping to give an objective judgment with the help of your knowledge and experience. The information you provided is only for the research of my doctor's thesis. We will strictly abide by the academic ethics and keep the information you provided confidential. Thank you for your support and cooperation.

Mr Lyu Gaizhi

Ph.D student in Technology

and Innovation Management

BanSomdej Chaopraya Rajaphat University

E-mail: 81539965@qq.com

Part 1: Information about the identity of qualified personnel

Please indicate the following information:

Name:

Educational Level

Job title

Position

Unit nature: institution University
 Enterprise Government

Is it a registered cto: Yes No

Sex: Male Female

Age:

20-30 years

31-40 years

41-50 years

51-60 years

61-70 years

Years of working experience:

Part 2: The semi-open questionnaire

In each issue that all experts have given their opinions according to each question, the researcher will combine them into conclusions. Subsection as a hypothesis example below. For each of you to consider in the Round 2, you will help to put sub-issues in each side as well.

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
1	Technical expertise and vision				
1.1	Technical expertise	The technical expertise of chief technology officer is the foundation of their role. It involves in-depth knowledge and understanding of various technologies, systems, and tools related to the industry and operations of the organization. This expertise enables chief technology officer to make informed decisions, design powerful technical solutions, and provide strategic guidance to other teams.			
1.2	Evaluate emerging technologies	Technical expertise enables the chief technology officer to evaluate emerging technologies and assess their potential impact on the organization. They can identify trends,			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		identify disruptive technologies, and recommend strategic investments to maintain a leading position in the competition			
1.3	Harnessing complex technological environments	In a rapidly evolving technological environment, the expertise of the chief technology officer enables them to navigate complex environments and make informed decisions. They ensure that the organization adopts the correct technology and continuously updates industry best practices.			
1.4	Building Scalable Solutions	chief technology officer's technical expertise enables them to design scalable and future-oriented solutions to adapt to the growth and constantly changing needs of the organization. They ensure that the technological infrastructure and systems can handle the growing demand.			
1.5	Addressing technical challenges	When faced with technical challenges, the expertise of the Chief Technical Officer comes into play to find effective solutions. They can solve problems, implement repair			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		programs, and minimize disruptions to business operations.			
1.6	Promoting innovation	The technical expertise of the chief technology officer cultivates a culture of innovation within the organization. They inspire technical teams to explore new ideas and attempt to use cutting-edge technology to drive business innovation.			
1.7					
1.8					
2	Business acumen and strategic thinking				
2.1	Driving Technology Strategy	With their professional knowledge, chief technology officers can create and implement comprehensive technical strategies that are aligned with the overall goals of the organization. They have identified opportunities to leverage			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		technology to gain competitive advantage, optimize processes, and drive growth			
2.2	Understand business objectives	Business acumen can help chief technology officers understand the organization's goals and objectives. With these understandings, they can adjust their technological strategies and initiatives to support and strengthen the achievement of these goals.			
2.3	decision-making	Strategic thinking enables the chief technology officer to make wise and thoughtful decisions on technology investment, resource allocation, and project priorities. They can weigh the broader impact on the organization and consider potential risks and benefits.			
2.4	financial management	Business acumen enables the chief technology officer to effectively manage technology budgets. They can effectively allocate resources, optimize technology expenditures, and demonstrate the return on investment of technology plans.			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
2.5	Market awareness	Strategic thinking includes maintaining an understanding of market trends, customer needs, and industry disruptions. The chief technology officer can use this knowledge to identify technology driven innovation opportunities that align with market demand.			
2.6	Value creation	Business intelligence allows chief technology officer to focus on creating value for the organization. They can determine how technology can improve products, services, and processes to drive revenue growth and customer satisfaction.			
2.7	Reduce risk	Strategic thinking includes predicting potential risks and challenges. The chief technology officer can develop contingency plans to mitigate risks related to technology implementation, cybersecurity, and data privacy.			
2.8	Innovation consistency	Business intelligence ensures that technology driven innovation is aligned with the overall business strategy of the organization. The chief technology officer can prioritize			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		innovative efforts to provide competitive advantage and drive growth.			
2.9	Cross functional collaboration	Strategic thinking promotes collaboration with other executives and department heads. The chief technology officer can collaborate with different stakeholders to align technology plans with broader business objectives.			
2.10	Opportunity assessment	Business intelligence enables the chief technology officer to evaluate new opportunities for adoption. They can identify areas where technology can optimize processes, reduce costs, and improve overall efficiency.			
2.11	Long term planning	Strategic thinking includes long-term planning and envisioning the future of the organization. The chief technology officer can develop a technology roadmap that is consistent with the organization's long-term vision and support its development trajectory.			
2.12	performance evaluation	Business acumen allows chief technology officer to evaluate the effectiveness of technical plans. They can use			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		key performance indicators (KPIs) to measure results and adjust strategies accordingly.			
2.13	A customer-centric approach	Strategic thinking helps chief technology officer adopt a customer-centric approach to technology development. They can prioritize technical solutions that meet customer needs and enhance the overall customer experience.			
2.14	competitive edge	Business acumen allows the chief technology officer to identify opportunities to gain competitive advantage through technological differentiation and innovation.			
2.15					
2.16					
3	Collaboration and team building				
3.1	Cross functional collaboration (chief technology officer works closely with	Collaboration allows chief technology officers to work closely with other executives, such as the CEO, CFO, COO, and CMO, to align technology strategies with broader business goals. By collaborating with different departments,			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
	other executives)	chief technology officer ensures that technical solutions support the organization.			
3.2	Collaboration with technical team	Technical expertise allows chief technology officer to have meaningful discussions with the technical team. They can provide guidance, guidance, and support to promote a collaborative and productive work environment.			
3.3	Effective communication	Collaboration requires effective communication skills. The chief technology officer must communicate technical concepts and strategies in a clear and concise manner to stakeholders at all levels of the organization, including non-technical personnel.			
3.4	Establish a high-performance team	Team building is crucial for forming and cultivating high-performance technical teams. The Chief Technical Officer is responsible for identifying and recruiting top talent, cultivating a positive work culture, and encouraging teamwork and camaraderie among team members.			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
3.5	Encourage team innovation	Collaboration creates an environment where team members are willing to share ideas and contribute to innovation. The chief technology officer encourages and values the opinions of team members, leading to breakthroughs and creative solutions.			
3.6	Authorize team members	The Chief Technical Officer authorizes team members to assume their own roles and responsibilities. By providing autonomy and trust, chief technology officer cultivates a sense of ownership and responsibility among team members.			
3.7	Guidance and professional development	Collaboration and team building enable the Chief Technical Officer to guide and support the professional development of team members. This includes providing training opportunities, career development guidance, and guidance.			
3.8	Conflict team resolution	In a collaborative work environment, conflicts may arise. The Chief Technical Officer must be proficient in conflict resolution and mediation to ensure that issues are quickly			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		and constructively resolved.			
3.9	Ensure team diversity and inclusivity	Collaboration and team building promote diversity and inclusiveness within the technical team. The chief technology officer ensures that different perspectives are valued and maintains an inclusive work environment.			
3.10	Adaptive leadership	Collaboration requires employees to possess adaptive leadership skills. The Chief Technical Officer must provide flexible and open feedback, adjusting their leadership style to meet the needs and preferences of different team members.			
3.11	Encourage open communication within the team	Team building involves creating an atmosphere of open communication and trust. The chief technology officer has developed an environment where team members are willing to express their opinions and concerns.			
3.12	Commending achievements	The Chief Technical Officer recognizes and celebrates the achievements of individual team members and the entire team. Recognizing one's achievements can boost morale			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		and motivate team members to stand out.			
3.13	Promoting knowledge sharing	Collaboration and team building encourage knowledge sharing among team members. The Chief Technical Officer provides team members with the opportunity to share professional knowledge, best practices, and lessons learned.			
3.14	Shared goals and vision	Collaboration ensures that all team members are aligned with the organization's goals and technical vision. The chief technology officer ensures that the team's efforts are synchronized with broader goals.			
3.15					
3.16					
4	Adaptability and resilience in high-tech environments				

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
4.1	Dynamic technology landscape (closely following technology hotspots)	The high-tech industry has experienced frequent technological progress and innovation. The chief technology officer must adapt to these changes and constantly update their knowledge and skills to maintain relevance and effectively lead technology initiatives.			
4.2	Agile decision-making	In a high-tech environment, market conditions and customer needs can rapidly change. The adaptability of the chief technology officer enables them to make quick and wise decisions and quickly respond to emerging opportunities and challenges.			
4.3	Embrace subversion	The high-tech industry is easily influenced by disruptive technologies that may reshape the market. The flexibility of the chief technology officer enables them to accept interruptions and identify opportunities to utilize these technologies for the benefit of the organization.			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
4.4	Navigation uncertainty (overcoming uncertainty)	Uncertainty is widely present in the high-tech field, such as changes in regulations, geopolitical factors, and economic fluctuations. The flexibility of the chief technology officer enables them to overcome uncertainty while maintaining a focus on the organization's long-term vision.			
4.5	Rotation strategy	The adaptability of the chief technology officer enables them to shift to technology strategies when necessary. They can shift their focus based on market trends and customer needs, ensuring that technical solutions align with business goals.			
4.6	Experimentation and Innovation	Flexibility encourages chief technology officer to cultivate a culture of experimentation and innovation within the organization. By accepting calculated risks, the chief technology officer can drive technology driven initiatives, thereby creating a competitive advantage.			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
4.7	Resolve failed issues	In the high-tech field, not all initiatives can be successful. The flexibility of the chief technology officer enables them to view failure as a learning opportunity and adjust strategies to improve future outcomes.			
4.8	Technical Implementation Challenges	Implementing new technologies may bring unforeseen challenges. The adaptability of the Chief Technical Officer enables them to adjust implementation plans and effectively overcome obstacles.			
4.9	Talent retention and development	The high-tech field is highly competitive for top technical talents. The flexibility of the chief technology officer enables them to develop strategies to retain and cultivate the best talents, ensuring the organization's ability to innovate and grow.			
4.10	Dealing with market fluctuations	The high-tech industry is susceptible to market fluctuations and disruptive trends. The flexibility of the chief technology officer enables them to withstand market fluctuations, positioning the organization for long-term success.			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
4.11	Leading through change	In a fast-paced high-tech environment, the resilience of the chief technology officer enables them to effectively lead change. They maintain a positive perspective, motivate the entire team, and unite the entire organization around common goals.			
4.12	Continuous learning	Adaptability and resilience drive chief technology officer to engage in continuous learning and professional development. Continuously understanding the latest trends and best practices can improve chief technology officer's efficiency as a technology leader.			
4.13					
4.14					
5	Cultivate innovation and research and development				
5.1	Ability to obtain information	The ability to acquire relevant knowledge in this field, especially cutting-edge knowledge related to the			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		development direction of this field, through multiple channels			
5.2	Inferential innovation ability	The ability to understand and reason about a thing by breaking it down into several parts or describing its internal connections through layers of causal relationships, thus innovating on the basis of that thing			
5.3	Project risk identification and control capabilities	Able to identify risks in the project and take measures to control them			
5.4	Research decision-making ability	Able to grasp the project from a macro perspective and determine its feasibility based on the information obtained			
5.5	Experimental observation ability	Pay attention to the operation of the project and be able to keenly observe the fluctuations in project operation			
5.6	Creating an Innovative Culture	Creating an innovative culture can cultivate creativity, drive continuous improvement, and drive the growth and success of an organization. As a chief technology officer, establishing an innovation culture within the technical team and the			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		entire organization is a key responsibility.			
5.7	Manage intellectual property and patent capabilities	By effectively managing intellectual property and patents, the chief technology officer ensures that the organization's technological innovation is protected, leverages competitive advantages, and contributes to its long-term success in the high-tech field.			
5.8	Integrating research and development with business objectives	For the chief technology officer (chief technology officer), it is crucial to align research and development (R&D) with business goals to ensure that technology plans align with organizational strategic goals and contribute to their long-term success. By effectively combining research and development with business objectives, chief technology officer can drive innovation, optimize resource allocation, and maximize the value of technology investment.			
5.9					
5.10					

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
6	Addressing regulatory and compliance challenges				
6.1	Ensure safety and compliance	Having a deep understanding of network security and data protection, ensuring that the organization's technical systems and data are secure and comply with relevant regulations.			
6.2	Addressing data privacy and security issues	In the era of widespread digital leaks and cyber threats, addressing data privacy and security issues is crucial for chief technology officers. As the custodian of technology infrastructure and data management, chief technology officer plays a crucial role in ensuring that the organization's data remains protected and complies with privacy regulations.			
6.3	Comply with industry standards and regulations	Compliance with industry standards and regulations is a key responsibility of the chief technology officer to ensure that organizations comply with legal requirements, industry best practices, and ethical guidelines. Failure to comply with these standards may result in legal liability, reputation			

Leadership for sustainable growth of high tech Enterprises					
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		damage, and operational interruption.			
6.4					
6.5					

Leadership for sustainable growth of high tech Enterprises					
Section 2 Sustainable development strategies that high-tech enterprises need to possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
7	Environmental Sustainability Initiative				
7.1	energy efficiency	Promote the adoption of energy-saving technologies and practices within the organization. This includes optimizing the data center, using energy-efficient hardware, and implementing power management strategies for devices.			
7.2	renewable energy	Explore opportunities for transitioning to renewable energy, such as solar, wind, or hydroelectric power, to power the organization's operations and reduce carbon emissions.			
7.3	Green IT procurement	Prioritize the procurement of environmentally friendly IT equipment to ensure that hardware and components comply with recognized environmental standards, such as Energy Star certification.			
7.4	Circular Economy Practice	Extend the service life of IT equipment through maintenance, refurbishment, and recycling, embracing the principles of circular economy. Promote responsible electronic waste			

Leadership for sustainable growth of high tech Enterprises					
Section 2 Sustainable development strategies that high-tech enterprises need to possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		management and collaborate with certified recycling suppliers.			
7.5	Virtualization and Cloud Computing	Encourage the adoption of virtualization and cloud computing to optimize resource utilization and reduce the physical footprint of IT infrastructure.			
7.6	Carbon footprint tracking	Implement a system to track and measure the organization's carbon footprint. Regularly evaluate and report on carbon emissions to identify areas for improvement.			
7.7	Sustainable software development	Encourage sustainable practices in software development, such as optimizing code to reduce energy consumption and minimize digital waste.			
7.8	Remote work and remote work	Promote the choice of remote work and remote work to reduce carbon emissions related to commuting and promote healthier work life balance for employees.			
7.9	Paperless Initiative	Promote paperless practices within organizations by encouraging digital documents, electronic signatures, and			

Leadership for sustainable growth of high tech Enterprises					
Section 2 Sustainable development strategies that high-tech enterprises need to possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		electronic communication.			
7.10	Employee Education and Participation	Educate employees on environmental sustainability and encourage them to actively participate in green initiatives. Carry out promotional activities and involve employees in sustainable development projects.			
7.11	Supplier Sustainable Development	Collaborate with suppliers and partners to ensure that sustainable development practices are integrated into the supply chain. Prioritize suppliers with strong environmental commitments.			
7.12	Green Data Center	Optimize data center operations to reduce energy consumption and waste. Consider energy-saving cooling solutions and utilize advanced power management tools.			
7.13	Green Building and Facility Management	If applicable, implement green building practices and sustainable facility management to reduce the overall environmental impact of the organization.			

Leadership for sustainable growth of high tech Enterprises					
Section 2 Sustainable development strategies that high-tech enterprises need to possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
7.14	Environmental certification	Strive to obtain recognized environmental certifications, such as LEED (Leadership in Energy and Environmental Design) or ISO 14001, to demonstrate the organization's commitment to sustainable development.			
7.15					
7.16					
8	Social Responsibility and Moral Practice				
8.1	Corporate Social Responsibility (CSR) Strategy	Collaborate with company leaders to develop a comprehensive corporate social responsibility strategy that aligns with organizational values and mission. Incorporate social and ethical considerations into technological decision-making.			
8.2	Ethical Technology Use	Ensure that technical solutions and applications adhere to ethical standards and respect user privacy and data security. Implement strict data protection measures to protect customer information.			

Leadership for sustainable growth of high tech Enterprises					
Section 2 Sustainable development strategies that high-tech enterprises need to possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
8.3	Inclusive design	Advocate inclusive design practices to cater to different user groups and consider accessibility needs. Ensure that all individuals have access to and use technology products and services.			
8.4	Environmental sustainability	Promote environmental sustainability initiatives and implement environmental practices in technology operations. This includes adopting energy-saving technologies, reducing electronic waste, and promoting sustainable IT practices.			
8.5	diversity and inclusion	Winning championships, diversity, and inclusivity within the technical team and the entire organization. Encourage different recruitment practices and create an inclusive work environment that values different perspectives.			
8.6	Ethical supply chain	Collaborate with suppliers and suppliers to ensure ethical practices throughout the entire supply chain. Prioritize cooperation with suppliers who adhere to fair labor practices and sustainable procurement.			

Leadership for sustainable growth of high tech Enterprises					
Section 2 Sustainable development strategies that high-tech enterprises need to possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
8.7	Responsible innovation	Cultivate a responsible innovation culture where technological initiatives consider potential social and ethical impacts. Predict and address any unexpected consequences of technical solutions.			
8.8	transparency and accountability	Practice transparency in technical operations and decision-making. Responsible for addressing the impact of technological initiatives on society, customers, and stakeholders.			
8.9	Ethical artificial intelligence and data ethics	Promote the ethical use of artificial intelligence (AI) and data ethics. Develop responsible guidelines for artificial intelligence deployment and data processing, taking into account potential biases and privacy issues.			
8.10	Community participation	Participate in local communities and participate in social initiatives to address community needs. Encourage technical teams to become volunteers and contribute their skills to social undertakings.			

Leadership for sustainable growth of high tech Enterprises					
Section 2 Sustainable development strategies that high-tech enterprises need to possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
8.11	Ethical standards and code of conduct	Develop and implement ethical standards and codes of conduct for the technical team. Ensure employees are aware of ethical expectations and follow best practices.			
8.12	Human rights and labor practices	Ensure that the organization's technical operations uphold human rights and fair labor practices. Avoid engaging in projects that lead to human rights violations or unethical labor practices.			
8.13	Stakeholder engagement	Engage with stakeholders, including customers, employees, investors, and the community, understand their concerns, and incorporate their feedback into technical strategies.			
8.14					
8.15					
9	Economic sustainability and long-term feasibility				
9.1	Business Model Assessment	Collaborate with business leaders to evaluate the organization's current business model and identify opportunities for improvement. Ensure consistency between			

Leadership for sustainable growth of high tech Enterprises					
Section 2 Sustainable development strategies that high-tech enterprises need to possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		technology plans and the organization's revenue generation and cost optimization strategies.			
9.2	Financial planning and budgeting	Work closely with the finance team to create realistic financial plans and budgets, and strategically allocate resources in technical projects. Prioritize plans with clear paths to generate value and return on investment (ROI).			
9.3	Profitability and cost control	Focus on improving profitability and optimizing operating costs. Assess technology related costs and explore opportunities for cost savings through automation, process improvement, and resource optimization.			
9.4	Market analysis and trends	Stay up-to-date with market trends, customer preferences, and emerging technologies. Utilize market insights to guide technical decisions and ensure that the organization remains competitive and relevant.			
9.5	Diversification of income streams	Encourage the use of organizational technological capabilities to explore new revenue streams and business opportunities.			

Leadership for sustainable growth of high tech Enterprises					
Section 2 Sustainable development strategies that high-tech enterprises need to possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		Diversification reduces dependence on a single source of income and enhances financial stability.			
9.6	risk management	Identify potential economic risks, such as market fluctuations, regulatory changes, or supply chain disruptions, and develop risk management strategies to mitigate their impact on the organization.			
9.7	Long term innovation investment	Balancing short-term technological initiatives with long-term investment in innovation. Cultivate a culture of continuous improvement, research and development (R&D) to drive sustainable growth.			
9.8	Agility and adaptability	Promote agility and adaptability within the technical team to quickly respond to constantly changing market conditions and customer needs. Adopting agile methods to ensure that technical plans remain relevant and flexible.			
9.9	Strategic partnership	Explore strategic partnerships and collaborations with other organizations to leverage complementary technologies and			

Leadership for sustainable growth of high tech Enterprises					
Section 2 Sustainable development strategies that high-tech enterprises need to possess					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		expand market reach.			
9.1	Talent management and retention	Invest in talent management programs to attract and retain top technical professionals. A skilled and proactive workforce helps drive innovation and maintain long-term viability.			
9.11	Environmental and Social Responsibility	Embrace sustainable development initiatives and corporate social responsibility practices. Demonstrating commitment to environmental and social issues can enhance an organization's reputation and appeal to stakeholders.			
9.12	Continuous monitoring and evaluation	Regularly monitor and evaluate the performance of technical plans based on economic goals. Use data-driven insights to make informed decisions and adjust strategies as needed.			
9.13					
9.14					

Leadership for sustainable growth of high tech Enterprises					
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
10	Key steps to fully utilize emerging technologies				
10.1	Technical Landscape Analysis	Conduct a comprehensive analysis of the current technological landscape, including market trends, emerging technologies, and potential disruptions. Please stay updated on the progress in various technical fields.			
10.2	Strategic coordination	Coordinate technology plans with the organization's long-term strategic goals. Identify areas where emerging technologies can support business goals and create competitive advantages			
10.3	Innovative mindset	Cultivate an innovative mindset within the technical team. Encourage creative thinking, experimentation, and willingness to explore new ideas and technologies.			
10.4	pilot project	Implement pilot projects to test and evaluate the feasibility and potential impact of emerging technologies. Use a concept validation plan to evaluate feasibility and scalability.			

Leadership for sustainable growth of high tech Enterprises					
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
10.5	Collaboration and Partnership	Collaborate with external partners such as startups, research institutions, and technology suppliers to gain a deeper understanding of cutting-edge technologies and explore collaboration opportunities.			
10.6	Data-driven decision-making	Technical decisions based on data-driven insights and performance metrics. Utilize analysis and market research to support the adoption of emerging technologies.			
10.7	Talent acquisition and development	Invest in talent acquisition and development, and establish a skilled workforce that can effectively utilize emerging technologies.			
10.8	Risk and Security Management	Assess the risks associated with adopting emerging technologies and develop risk management strategies. Prioritize data security and privacy considerations.			
10.9	Scalability and flexibility	Evaluate the scalability and flexibility of emerging technologies to ensure they can meet future organizational needs and adapt to constantly changing market demands.			

Leadership for sustainable growth of high tech Enterprises					
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
10.1	Regulatory compliance	Continuously updating regulations and compliance requirements related to emerging technologies. Ensure that the organization complies with relevant laws and industry standards.			
10.11	Technical roadmap	Develop a technology roadmap outlining the integration and deployment of emerging technologies. The plan is implemented in stages to minimize interruptions.			
10.12	User centric approach	When implementing emerging technologies, a user centric approach should be adopted. Focusing on creating value for customers and enhancing user experience.			
10.13	Continuous evaluation and improvement	Continuously evaluate the impact of the adopted technology on organizational goals. Be prepared to adjust strategies based on feedback and performance results.			
10.14					
10.15					
11	Key steps to fully utilize data analysis and decision-making				

Leadership for sustainable growth of high tech Enterprises					
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
11.1	Visualization and Communication	Utilize data visualization tools to provide insights to stakeholders in a clear and actionable format. Communicate the research results of the data analysis plan to key decision-makers to influence strategic choices.			
11.2	Predictive analysis for prediction	Use predictive analysis to predict future trends, market demand, and customer behavior. Use predictive models to identify potential risks and opportunities, enabling organizations to proactively respond to challenges.			
11.3	Real time analysis of agility	Implement real-time analysis function to achieve agile decision-making. Real time insight allows organizations to quickly respond to constantly changing situations.			
11.4	Ethical considerations	Ensure that the data analysis process complies with ethical standards, especially in terms of data privacy and protection. Responsible and transparent use of data to build trust with customers and stakeholders.			
11.5	Continuous improvement	Embrace a culture of continuous improvement in data analysis practices. Regularly review and optimize the data			

Leadership for sustainable growth of high tech Enterprises					
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		analysis process to improve its effectiveness.			
11.6					
11.7					
12	Strategies to overcome the resistance of sustainable reform in enterprises				
12.1	effective communication	Clearly and transparently communicate the fundamental principles behind change, explain how it aligns with the organization's goals, and benefit all stakeholders. Open resolution of concerns and issues, regularly providing updates on changes and progress.			
12.2	Early engagement with stakeholders	Engage key stakeholders from the beginning of the change process, including employees, managers, and department heads. Seek their opinions, listen to their feedback, and incorporate their ideas into the change plan.			
12.3	Create a shared vision	Develop a shared vision for change, resonate with employees, and motivate them to support the initiative.			

Leadership for sustainable growth of high tech Enterprises					
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		Emphasize the positive impact of change on individuals and organizations.			
12.4	Authorize change agents	Identify change advocates within the organization who can advocate for change and actively influence others. Authorize change agents to lead by example and share success stories.			
12.5	Provide training and support	Provide training and development projects to help employees develop the skills needed to successfully adapt to change. Provide continuous support and resources to ensure employees feel confident in implementing change.			
12.6	Addressing Fear and Uncertainty	Acknowledging that change may be unsettling and openly and generously addressing employees' fears and concerns. Provide assurance and support throughout the entire transition process.			
12.7	Celebrate Rapid Victory	Identify and celebrate rapid victories to showcase positive results of early changes in the process. Recognize and reward individuals and teams for their contributions to the			

Leadership for sustainable growth of high tech Enterprises					
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		successful implementation of change.			
12.8	Break down changes into manageable steps	Divide changes into smaller and manageable steps, making it easier for employees to gradually adapt. Celebrate every step of progress to build motivation and motivate employees.			
12.9	Lead by example	As a chief technology officer, as a role model, embrace change and demonstrate a willingness to learn and adapt. Show commitment to change initiatives to motivate others to follow suit.			
12.10	Monitoring and adjustment	Continuously monitor the progress of changes and prepare to adjust methods as needed. Maintain flexibility and responsiveness to feedback and constantly changing environments.			
12.11					
12.12					
13	Strategies for managing stakeholder expectations				

Leadership for sustainable growth of high tech Enterprises					
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
13.1	Open and transparent communication	Cultivate an open and transparent communication culture with stakeholders. Regularly provide progress on technical projects, including successes, challenges, and any changes in time or scope.			
13.2	Actively listening	Actively listen to the concerns, feedback, and expectations of stakeholders. Show empathy and understanding, and quickly resolve any issues raised.			
13.3	Set realistic expectations	Timeline, costs, and potential outcomes of real-world technology plans. Avoid excessive commitment and insufficient delivery, as this may erode the trust of stakeholders.			
13.4	Establish clear goals and objectives	Clearly define the goals and objectives of technical projects based on the overall strategy of the organization. Ensure that stakeholders have a clear understanding of the project's purpose and expected outcomes.			
13.5	Engage stakeholders as early as possible	Engage stakeholders in the early stages of technology projects to gather their opinions and insights. Engaging			

Leadership for sustainable growth of high tech Enterprises					
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		stakeholders in the decision-making process can enhance their ownership and support.			
13.6	Provide demonstrations and progress reports	Provide technical solutions or prototype demonstrations to stakeholders to visualize potential benefits. Provide progress reports with measurable results to demonstrate the value of the project.			
13.7	Manage risks and issues	Proactively identify and manage risks and issues related to technical projects. Communicate mitigation plans to stakeholders to instill confidence in project management.			
13.8	Building trust and credibility	Demonstrate ability and expertise in technical issues to build trust and credibility with stakeholders. Respond reliably to their concerns.			
13.9	Resolve conflicts and differences of opinion	Predict conflicts and disagreements among stakeholders and constructively address these issues. Seek common ground and compromise to find the most suitable solution for the organization's interests.			

Leadership for sustainable growth of high tech Enterprises					
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
13.10	Continuous engagement	Maintain continuous engagement with stakeholders throughout the entire project lifecycle. Seek their opinions at key decision points and ensure that their expectations are taken into account.			
13.11	Celebrate achievements	Celebrate project milestones and successes with stakeholders to strengthen their support and enthusiasm for future plans.			
13.12					
13.13					

Leadership for sustainable growth of high tech Enterprises					
Section 4 Prediction of the Future Role of chief technology officer					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
14.1	Focus on digital transformation	chief technology officer will take the lead in carrying out digital transformation work, guiding organizations to adopt emerging technologies and digital processes to improve efficiency and customer experience.			
14.2	Data-driven decision-making	chief technology officer will utilize data analysis and artificial intelligence to make informed, data-driven decisions to optimize business operations and drive growth. They will be responsible for identifying valuable insights from a large dataset to gain a competitive advantage.			
14.3	Leading position in cybersecurity	With the increasing prevalence of cyber threats, chief technology officer will play a crucial role in ensuring the soundness and up-to-date nature of the organization's cybersecurity measures. They will prioritize network security risk management to protect sensitive data and intellectual property.			

Leadership for sustainable growth of high tech Enterprises					
Section 4 Prediction of the Future Role of chief technology officer					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
14.4	Sustainability and ethical technology adoption	chief technology officer will actively support sustainable and ethical technology practices, taking into account the environmental and social impacts of technology adoption. They will strive to achieve responsible artificial intelligence and data usage.			
14.5	Customer centric innovation	chief technology officer will promote customer-centric innovation by focusing on user experience and ensuring that technological solutions meet customer needs. They will be at the forefront of developing personalized and seamless digital experiences.			
14.6	Agility and flexibility	chief technology officer will adopt agile methods and promote an adaptive culture to quickly respond to market changes and constantly changing customer needs.			
14.7	Collaboration with senior executives	chief technology officer will work closely with other executives, including the CEO, CFO, and CMO, to align			

Leadership for sustainable growth of high tech Enterprises					
Section 4 Prediction of the Future Role of chief technology officer					
NO	Item	Definition	Comment		Suggestion
			Agree	Disagree	
		technology strategy with broader business goals.			
14.8	Talent management and skill enhancement skills	chief technology officer will play an important role in attracting and retaining top technical talents, ensuring that employees have the opportunity to improve their skills and continue learning.			
14.9	Emphasize the innovation ecosystem	chief technology officer will explore partnerships, collaboration, and open innovation to create dynamic ecosystems, promote innovation, and acquire cutting-edge technologies.			
14.10	Addressing Regulatory Challenges	chief technology officer will address complex regulatory environments and ensure compliance with data protection and privacy regulations.			
14.11					

Expert Interview (EDFR Round 2)

Leadership for sustainable growth of high-tech enterprises in Guangxi Province

Clarification

This interview is intended as a tool for interviewing qualified personnel. The Round 2 of Leadership for sustainable growth of high-tech enterprises in Guangxi Province.

Your interview will help to create a questionnaire about the Leadership for sustainable growth of high-tech enterprises in Guangxi Province.

The interview consists of two parts:

Part 1: Information about the identity of qualified personnel.

Part 2: Interview questions about Leadership for sustainable growth of high-tech enterprises in Guangxi Province

Thank you for taking the time to fill in this questionnaire. The purpose of this questionnaire is to conduct a preliminary screening of the evaluation index system for the leadership of high-tech enterprises, hoping to give an objective judgment with the help of your knowledge and experience. The information you provided is only for the research of my doctor's thesis. We will strictly abide by the academic ethics and keep the information you provided confidential. Thank you for your support and cooperation.

Mr Lyu Gaizhi

Ph.D student in Technology
and Innovation Management

BanSomdej Chaopraya Rajaphat University

E-mail: 81539965@qq.com

Part 1:Information about the identity of qualified personnel

Please indicate the following information:

Name :

Educational Level

Job title

Position

Unit nature: () institution () University

() Enterprise () Government

Is it a registered cto: () Yes () No

Sex : () Male () Female

Age:

() 20-30 years

() 31-40 years

() 41-50 years

() 51-60 years

() 61-70 years

Years of working experience:

Part 2: The semi-open questionnaire

In each issue that all experts have given their opinions according to each question, the researcher will combine them into conclusions .Subsection as a hypothesis example below. For each of you to consider in the third round, you will help to put sub-issues in each side as well.

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
Technical expertise and vision							
1	Technical expertise	The technical expertise of chief technology officer is the foundation of their role. It involves in-depth knowledge and understanding of various technologies, systems, and tools related to the industry and operations of the organization. This expertise enables chief technology officer to make informed decisions, design powerful technical solutions, and provide strategic guidance to other teams.					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
2	Evaluate emerging technologies	Technical expertise enables the chief technology officer to evaluate emerging technologies and assess their potential impact on the organization. They can identify trends, identify disruptive technologies, and recommend strategic investments to maintain a leading position in the competition					
3	Harnessing complex technological environments	In a rapidly evolving technological environment, the expertise of the chief technology officer enables them to navigate complex environments and make informed decisions. They ensure that the organization adopts the correct technology and continuously updates industry best practices.					
4	Building Scalable Solutions	chief technology officer's technical expertise enables them to design scalable and future-oriented solutions to adapt to the growth and constantly changing needs of the organization. They ensure that the					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
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			5	4	3	2	1
		technological infrastructure and systems can handle the growing demand.					
5	Addressing technical challenges	When faced with technical challenges, the expertise of the Chief Technical Officer comes into play to find effective solutions. They can solve problems, implement repair programs, and minimize disruptions to business operations.					
6	Promoting innovation	The technical expertise of the chief technology officer cultivates a culture of innovation within the organization. They inspire technical teams to explore new ideas and attempt to use cutting-edge technology to drive business innovation.					
Business acumen and strategic thinking							

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
7	Driving Technology Strategy	With their professional knowledge, chief technology officers can create and implement comprehensive technical strategies that are aligned with the overall goals of the organization. They have identified opportunities to leverage technology to gain competitive advantage, optimize processes, and drive growth					
8	Understand business objectives	Business acumen can help chief technology officers understand the organization's goals and objectives. With these understandings, they can adjust their technological strategies and initiatives to support and strengthen the achievement of these goals.					
9	decision-making	Strategic thinking enables the chief technology officer to make wise and thoughtful decisions on technology investment, resource allocation, and project priorities. They can weigh the broader impact on the organization and consider potential risks and benefits.					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
10	financial management	Business acumen enables the chief technology officer to effectively manage technology budgets. They can effectively allocate resources, optimize technology expenditures, and demonstrate the return on investment of technology plans.					
11	Market awareness	Strategic thinking includes maintaining an understanding of market trends, customer needs, and industry disruptions. The chief technology officer can use this knowledge to identify technology driven innovation opportunities that align with market demand.					
12	Value creation	Business intelligence allows chief technology officer to focus on creating value for the organization. They can determine how technology can improve products, services, and processes to drive revenue growth and customer satisfaction.					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
13	Reduce risk	Strategic thinking includes predicting potential risks and challenges. The chief technology officer can develop contingency plans to mitigate risks related to technology implementation, cybersecurity, and data privacy.					
14	Innovation consistency	Business intelligence ensures that technology driven innovation is aligned with the overall business strategy of the organization. The chief technology officer can prioritize innovative efforts to provide competitive advantage and drive growth.					
15	Cross functional collaboration	Strategic thinking promotes collaboration with other executives and department heads. The chief technology officer can collaborate with different stakeholders to align technology plans with broader business objectives.					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
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			5	4	3	2	1
16	Opportunity assessment	Business intelligence enables the chief technology officer to evaluate new opportunities for adoption. They can identify areas where technology can optimize processes, reduce costs, and improve overall efficiency.					
17	Long term planning	Strategic thinking includes long-term planning and envisioning the future of the organization. The chief technology officer can develop a technology roadmap that is consistent with the organization's long-term vision and support its development trajectory.					
18	performance evaluation	Business acumen allows chief technology officer to evaluate the effectiveness of technical plans. They can use key performance indicators (KPIs) to measure results and adjust strategies accordingly.					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
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19	A customer-centric approach	Strategic thinking helps chief technology officer adopt a customer-centric approach to technology development. They can prioritize technical solutions that meet customer needs and enhance the overall customer experience.					
20	competitive edge	Business acumen allows the chief technology officer to identify opportunities to gain competitive advantage through technological differentiation and innovation.					
Collaboration and team building							
21	Cross functional collaboration (chief technology officer works closely with other executives)	Collaboration allows chief technology officers to work closely with other executives, such as the CEO, CFO, COO, and CMO, to align technology strategies with broader business goals. By collaborating with different departments, chief technology officer ensures that technical solutions support the organization.					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
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22	Collaboration with technical team	Technical expertise allows chief technology officer to have meaningful discussions with the technical team. They can provide guidance, guidance, and support to promote a collaborative and productive work environment.					
23	Effective communication	Collaboration requires effective communication skills. The chief technology officer must communicate technical concepts and strategies in a clear and concise manner to stakeholders at all levels of the organization, including non-technical personnel.					
24	Establish a high-performance team	Team building is crucial for forming and cultivating high-performance technical teams. The Chief Technical Officer is responsible for identifying and recruiting top talent, cultivating a positive work culture, and encouraging teamwork and camaraderie among team members.					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
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25	Encourage team innovation	Collaboration creates an environment where team members are willing to share ideas and contribute to innovation. The chief technology officer encourages and values the opinions of team members, leading to breakthroughs and creative solutions.					
26	Authorize team members	The Chief Technical Officer authorizes team members to assume their own roles and responsibilities. By providing autonomy and trust, chief technology officer cultivates a sense of ownership and responsibility among team members.					
27	Guidance and professional development	Collaboration and team building enable the Chief Technical Officer to guide and support the professional development of team members. This includes providing training opportunities, career development guidance, and guidance.					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
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28	Conflict team resolution	In a collaborative work environment, conflicts may arise. The Chief Technical Officer must be proficient in conflict resolution and mediation to ensure that issues are quickly and constructively resolved.					
29	Ensure team diversity and inclusivity	Collaboration and team building promote diversity and inclusiveness within the technical team. The chief technology officer ensures that different perspectives are valued and maintains an inclusive work environment.					
30	Adaptive leadership	Collaboration requires employees to possess adaptive leadership skills. The Chief Technical Officer must provide flexible and open feedback, adjusting their leadership style to meet the needs and preferences of different team members.					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
31	Encourage open communication within the team	Team building involves creating an atmosphere of open communication and trust. The chief technology officer has developed an environment where team members are willing to express their opinions and concerns.					
32	Commending achievements	The Chief Technical Officer recognizes and celebrates the achievements of individual team members and the entire team. Recognizing one's achievements can boost morale and motivate team members to stand out.					
33	Promoting knowledge sharing	Collaboration and team building encourage knowledge sharing among team members. The Chief Technical Officer provides team members with the opportunity to share professional knowledge, best practices, and lessons learned.					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
34	Shared goals and vision	Collaboration ensures that all team members are aligned with the organization's goals and technical vision. The chief technology officer ensures that the team's efforts are synchronized with broader goals.					
Adaptability and resilience in high-tech environments							
35	Dynamic technology landscape (closely following technology hotspots)	The high-tech industry has experienced frequent technological progress and innovation. The chief technology officer must adapt to these changes and constantly update their knowledge and skills to maintain relevance and effectively lead technology initiatives.					
36	Agile decision-making	In a high-tech environment, market conditions and customer needs can rapidly change. The adaptability of the chief technology officer enables them to make quick and wise decisions and quickly respond to emerging opportunities and challenges.					

Leadership for sustainable growth of high tech Enterprises							
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37	Embrace subversion	The high-tech industry is easily influenced by disruptive technologies that may reshape the market. The flexibility of the chief technology officer enables them to accept interruptions and identify opportunities to utilize these technologies for the benefit of the organization.					
38	Navigation uncertainty (overcoming uncertainty)	Uncertainty is widely present in the high-tech field, such as changes in regulations, geopolitical factors, and economic fluctuations. The flexibility of the chief technology officer enables them to overcome uncertainty while maintaining a focus on the organization's long-term vision.					
39	Rotation strategy	The adaptability of the chief technology officer enables them to shift to technology strategies when necessary. They can shift their focus based on market trends and customer needs, ensuring that technical solutions align with business goals.					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
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			5	4	3	2	1
40	Experimentation and Innovation	Flexibility encourages chief technology officer to cultivate a culture of experimentation and innovation within the organization. By accepting calculated risks, the chief technology officer can drive technology driven initiatives, thereby creating a competitive advantage.					
41	Resolve failed issues	In the high-tech field, not all initiatives can be successful. The flexibility of the chief technology officer enables them to view failure as a learning opportunity and adjust strategies to improve future outcomes.					
42	Technical Implementation Challenges	Implementing new technologies may bring unforeseen challenges. The adaptability of the Chief Technical Officer enables them to adjust implementation plans and effectively overcome obstacles.					
43	Talent retention and development	The high-tech field is highly competitive for top technical talents. The flexibility of the chief technology officer enables them to develop strategies to retain and cultivate the best talents, ensuring the					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
		organization's ability to innovate and grow.					
44	Dealing with market fluctuations	The high-tech industry is susceptible to market fluctuations and disruptive trends. The flexibility of the chief technology officer enables them to withstand market fluctuations, positioning the organization for long-term success.					
45	Leading through change	In a fast-paced high-tech environment, the resilience of the chief technology officer enables them to effectively lead change. They maintain a positive perspective, motivate the entire team, and unite the entire organization around common goals.					
46	Continuous learning	Adaptability and resilience drive chief technology officer to engage in continuous learning and professional development. Continuously understanding the latest trends and best practices can improve chief					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
		technology officer's efficiency as a technology leader.					
Cultivate innovation and research and development							
47	Ability to obtain information	The ability to acquire relevant knowledge in this field, especially cutting-edge knowledge related to the development direction of this field, through multiple channels					
48	Inferential innovation ability	The ability to understand and reason about a thing by breaking it down into several parts or describing its internal connections through layers of causal relationships, thus innovating on the basis of that thing					
49	Project risk identification and control capabilities	Able to identify risks in the project and take measures to control them					
50	Research decision-making ability	Able to grasp the project from a macro perspective and determine its feasibility based on the information obtained					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
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51	Experimental observation ability	Pay attention to the operation of the project and be able to keenly observe the fluctuations in project operation					
52	Creating an Innovative Culture	Creating an innovative culture can cultivate creativity, drive continuous improvement, and drive the growth and success of an organization. As a chief technology officer, establishing an innovation culture within the technical team and the entire organization is a key responsibility.					
53	Manage intellectual property and patent capabilities	By effectively managing intellectual property and patents, the chief technology officer ensures that the organization's technological innovation is protected, leverages competitive advantages, and contributes to its long-term success in the high-tech field.					

Leadership for sustainable growth of high tech Enterprises							
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NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
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54	Integrating research and development with business objectives	For the chief technology officer (chief technology officer), it is crucial to align research and development (R&D) with business goals to ensure that technology plans align with organizational strategic goals and contribute to their long-term success. By effectively combining research and development with business objectives, chief technology officer can drive innovation, optimize resource allocation, and maximize the value of technology investment.					
Addressing regulatory and compliance challenges							
55	Ensure safety and compliance	Having a deep understanding of network security and data protection, ensuring that the organization's technical systems and data are secure and comply with relevant regulations.					

Leadership for sustainable growth of high tech Enterprises							
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
56	Addressing data privacy and security issues	In the era of widespread digital leaks and cyber threats, addressing data privacy and security issues is crucial for chief technology officers (chief technology officers). As the custodian of technology infrastructure and data management, chief technology officer plays a crucial role in ensuring that the organization's data remains protected and complies with privacy regulations.					
57	Comply with industry standards and regulations	Compliance with industry standards and regulations is a key responsibility of the chief technology officer (chief technology officer) to ensure that organizations comply with legal requirements, industry best practices, and ethical guidelines. Failure to comply with these standards may result in legal liability, reputation damage, and operational interruption.					

Leadership for sustainable growth of high tech Enterprises							
Section 2 Sustainable development strategies that high-tech enterprises need to possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
Environmental Sustainability Initiative							
58	energy efficiency	Promote the adoption of energy-saving technologies and practices within the organization. This includes optimizing the data center, using energy-efficient hardware, and implementing power management strategies for devices.					
59	renewable energy	Explore opportunities for transitioning to renewable energy, such as solar, wind, or hydroelectric power, to power the organization's operations and reduce carbon emissions.					
60	Green IT procurement	Prioritize the procurement of environmentally friendly IT equipment to ensure that hardware and components comply with recognized environmental standards, such as Energy Star certification.					

Leadership for sustainable growth of high tech Enterprises							
Section 2 Sustainable development strategies that high-tech enterprises need to possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
61	Circular Economy Practice	Extend the service life of IT equipment through maintenance, refurbishment, and recycling, embracing the principles of circular economy. Promote responsible electronic waste management and collaborate with certified recycling suppliers.					
62	Virtualization and Cloud Computing	Encourage the adoption of virtualization and cloud computing to optimize resource utilization and reduce the physical footprint of IT infrastructure.					
63	Carbon footprint tracking	Implement a system to track and measure the organization's carbon footprint. Regularly evaluate and report on carbon emissions to identify areas for improvement.					
64	Sustainable software development	Encourage sustainable practices in software development, such as optimizing code to reduce energy consumption and minimize digital waste.					

Leadership for sustainable growth of high tech Enterprises							
Section 2 Sustainable development strategies that high-tech enterprises need to possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
65	Remote work and remote work	Promote the choice of remote work and remote work to reduce carbon emissions related to commuting and promote healthier work life balance for employees.					
66	Paperless Initiative	Promote paperless practices within organizations by encouraging digital documents, electronic signatures, and electronic communication.					
67	Employee Education and Participation	Educate employees on environmental sustainability and encourage them to actively participate in green initiatives. Carry out promotional activities and involve employees in sustainable development projects.					
68	Supplier Sustainable Development	Collaborate with suppliers and partners to ensure that sustainable development practices are integrated into the supply chain. Prioritize suppliers with strong environmental commitments.					

Leadership for sustainable growth of high tech Enterprises							
Section 2 Sustainable development strategies that high-tech enterprises need to possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
69	Green Data Center	Optimize data center operations to reduce energy consumption and waste. Consider energy-saving cooling solutions and utilize advanced power management tools.					
70	Green Building and Facility Management	If applicable, implement green building practices and sustainable facility management to reduce the overall environmental impact of the organization.					
71	Environmental certification	Strive to obtain recognized environmental certifications, such as LEED (Leadership in Energy and Environmental Design) or ISO 14001, to demonstrate the organization's commitment to sustainable development.					
Social Responsibility and Moral Practice							

Leadership for sustainable growth of high tech Enterprises							
Section 2 Sustainable development strategies that high-tech enterprises need to possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
72	Corporate Social Responsibility (CSR) Strategy	Collaborate with company leaders to develop a comprehensive corporate social responsibility strategy that aligns with organizational values and mission. Incorporate social and ethical considerations into technological decision-making.					
73	Ethical Technology Use	Ensure that technical solutions and applications adhere to ethical standards and respect user privacy and data security. Implement strict data protection measures to protect customer information.					
74	Inclusive design	Advocate inclusive design practices to cater to different user groups and consider accessibility needs. Ensure that all individuals have access to and use technology products and services.					
75	Environmental sustainability	Promote environmental sustainability initiatives and implement environmental practices in technology operations. This includes adopting energy-saving technologies, reducing electronic waste,					

Leadership for sustainable growth of high tech Enterprises							
Section 2 Sustainable development strategies that high-tech enterprises need to possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
		and promoting sustainable IT practices.					
76	diversity and inclusion	Winning championships, diversity, and inclusivity within the technical team and the entire organization. Encourage different recruitment practices and create an inclusive work environment that values different perspectives.					
77	Ethical supply chain	Collaborate with suppliers and suppliers to ensure ethical practices throughout the entire supply chain. Prioritize cooperation with suppliers who adhere to fair labor practices and sustainable procurement.					
78	Responsible innovation	Cultivate a responsible innovation culture where technological initiatives consider potential social and ethical impacts. Predict and address any unexpected consequences of technical solutions.					

Leadership for sustainable growth of high tech Enterprises							
Section 2 Sustainable development strategies that high-tech enterprises need to possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
79	transparency and accountability	Practice transparency in technical operations and decision-making. Responsible for addressing the impact of technological initiatives on society, customers, and stakeholders.					
80	Ethical artificial intelligence and data ethics	Promote the ethical use of artificial intelligence (AI) and data ethics. Develop responsible guidelines for artificial intelligence deployment and data processing, taking into account potential biases and privacy issues.					
81	Community participation	Participate in local communities and participate in social initiatives to address community needs. Encourage technical teams to become volunteers and contribute their skills to social undertakings.					
82	Ethical standards and code of conduct	Develop and implement ethical standards and codes of conduct for the technical team. Ensure employees are aware of ethical					

Leadership for sustainable growth of high tech Enterprises							
Section 2 Sustainable development strategies that high-tech enterprises need to possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
		expectations and follow best practices.					
83	Human rights and labor practices	Ensure that the organization's technical operations uphold human rights and fair labor practices. Avoid engaging in projects that lead to human rights violations or unethical labor practices.					
84	Stakeholder engagement	Engage with stakeholders, including customers, employees, investors, and the community, understand their concerns, and incorporate their feedback into technical strategies.					
Economic sustainability and long-term feasibility							
85	Business Model Assessment	Collaborate with business leaders to evaluate the organization's current business model and identify opportunities for improvement. Ensure consistency between technology plans and the organization's revenue generation and cost optimization					

Leadership for sustainable growth of high tech Enterprises							
Section 2 Sustainable development strategies that high-tech enterprises need to possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
		strategies.					
86	Financial planning and budgeting	Work closely with the finance team to create realistic financial plans and budgets, and strategically allocate resources in technical projects. Prioritize plans with clear paths to generate value and return on investment (ROI).					
87	Profitability and cost control	Focus on improving profitability and optimizing operating costs. Assess technology related costs and explore opportunities for cost savings through automation, process improvement, and resource optimization.					
88	Market analysis and trends	Stay up-to-date with market trends, customer preferences, and emerging technologies. Utilize market insights to guide technical decisions and ensure that the organization remains competitive					

Leadership for sustainable growth of high tech Enterprises							
Section 2 Sustainable development strategies that high-tech enterprises need to possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
		and relevant.					
89	Diversification of income streams	Encourage the use of organizational technological capabilities to explore new revenue streams and business opportunities. Diversification reduces dependence on a single source of income and enhances financial stability.					
90	risk management	Identify potential economic risks, such as market fluctuations, regulatory changes, or supply chain disruptions, and develop risk management strategies to mitigate their impact on the organization.					
91	Long term innovation investment	Balancing short-term technological initiatives with long-term investment in innovation. Cultivate a culture of continuous improvement, research and development (R&D) to drive sustainable growth.					

Leadership for sustainable growth of high tech Enterprises							
Section 2 Sustainable development strategies that high-tech enterprises need to possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
92	Agility and adaptability	Promote agility and adaptability within the technical team to quickly respond to constantly changing market conditions and customer needs. Adopting agile methods to ensure that technical plans remain relevant and flexible.					
93	Strategic partnership	Explore strategic partnerships and collaborations with other organizations to leverage complementary technologies and expand market reach.					
94	Talent management and retention	Invest in talent management programs to attract and retain top technical professionals. A skilled and proactive workforce helps drive innovation and maintain long-term viability.					
95	Environmental and Social Responsibility	Embrace sustainable development initiatives and corporate social responsibility practices. Demonstrating commitment to environmental and social issues can enhance an organization's					

Leadership for sustainable growth of high tech Enterprises							
Section 2 Sustainable development strategies that high-tech enterprises need to possess							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
		reputation and appeal to stakeholders.					
96	Continuous monitoring and evaluation	Regularly monitor and evaluate the performance of technical plans based on economic goals. Use data-driven insights to make informed decisions and adjust strategies as needed.					

Leadership for sustainable growth of high tech Enterprises							
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
Key steps to fully utilize emerging technologies							
97	Technical Landscape Analysis	Conduct a comprehensive analysis of the current technological landscape, including market trends, emerging technologies, and potential disruptions. Please stay updated on the progress in various technical fields.					
98	Strategic coordination	Coordinate technology plans with the organization's long-term strategic goals. Identify areas where emerging technologies can support business goals and create competitive advantages					
99	Innovative mindset	Cultivate an innovative mindset within the technical team. Encourage creative thinking, experimentation, and willingness to explore new ideas and technologies.					

Leadership for sustainable growth of high tech Enterprises							
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
100	pilot project	Implement pilot projects to test and evaluate the feasibility and potential impact of emerging technologies. Use a concept validation plan to evaluate feasibility and scalability.					
101	Collaboration and Partnership	Collaborate with external partners such as startups, research institutions, and technology suppliers to gain a deeper understanding of cutting-edge technologies and explore collaboration opportunities.					
102	Data-driven decision-making	Technical decisions based on data-driven insights and performance metrics. Utilize analysis and market research to support the adoption of emerging technologies.					
103	Talent acquisition and development	Invest in talent acquisition and development, and establish a skilled workforce that can effectively utilize emerging technologies.					

Leadership for sustainable growth of high tech Enterprises							
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
104	Risk and Security Management	Assess the risks associated with adopting emerging technologies and develop risk management strategies. Prioritize data security and privacy considerations.					
105	Scalability and flexibility	Evaluate the scalability and flexibility of emerging technologies to ensure they can meet future organizational needs and adapt to constantly changing market demands.					
106	Regulatory compliance	Continuously updating regulations and compliance requirements related to emerging technologies. Ensure that the organization complies with relevant laws and industry standards.					
107	Technical roadmap	Develop a technology roadmap outlining the integration and deployment of emerging technologies. The plan is implemented in stages to minimize interruptions.					

Leadership for sustainable growth of high tech Enterprises							
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
108	User centric approach	When implementing emerging technologies, a user centric approach should be adopted. Focusing on creating value for customers and enhancing user experience.					
109	Continuous evaluation and improvement	Continuously evaluate the impact of the adopted technology on organizational goals. Be prepared to adjust strategies based on feedback and performance results.					
Key steps to fully utilize data analysis and decision-making							
110	Visualization and Communication	Utilize data visualization tools to provide insights to stakeholders in a clear and actionable format. Communicate the research results of the data analysis plan to key decision-makers to influence strategic choices.					

Leadership for sustainable growth of high tech Enterprises							
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
111	Predictive analysis for prediction	Use predictive analysis to predict future trends, market demand, and customer behavior. Use predictive models to identify potential risks and opportunities, enabling organizations to proactively respond to challenges.					
112	Real time analysis of agility	Implement real-time analysis function to achieve agile decision-making. Real time insight allows organizations to quickly respond to constantly changing situations.					
113	Ethical considerations	Ensure that the data analysis process complies with ethical standards, especially in terms of data privacy and protection. Responsible and transparent use of data to build trust with customers and stakeholders.					
114	Continuous improvement	Embrace a culture of continuous improvement in data analysis practices. Regularly review and optimize the data analysis					

Leadership for sustainable growth of high tech Enterprises								
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises								
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			5	4	3	2	1	
		process to improve its effectiveness.						
Strategies to overcome the resistance of sustainable reform in enterprises								
115	effective communication	Clearly and transparently communicate the fundamental principles behind change, explain how it aligns with the organization's goals, and benefit all stakeholders. Open resolution of concerns and issues, regularly providing updates on changes and progress.						
116	Early engagement with stakeholders	Engage key stakeholders from the beginning of the change process, including employees, managers, and department heads. Seek their opinions, listen to their feedback, and incorporate their ideas into the change plan.						

Leadership for sustainable growth of high tech Enterprises							
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
117	Create a shared vision	Develop a shared vision for change, resonate with employees, and motivate them to support the initiative. Emphasize the positive impact of change on individuals and organizations.					
118	Authorize change agents	Identify change advocates within the organization who can advocate for change and actively influence others. Authorize change agents to lead by example and share success stories.					
119	Provide training and support	Provide training and development projects to help employees develop the skills needed to successfully adapt to change. Provide continuous support and resources to ensure employees feel confident in implementing change.					
120	Addressing Fear and Uncertainty	Acknowledging that change may be unsettling and openly and generously addressing employees' fears and concerns. Provide assurance and support throughout the entire transition process.					

Leadership for sustainable growth of high tech Enterprises							
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
121	Celebrate Rapid Victory	Identify and celebrate rapid victories to showcase positive results of early changes in the process. Recognize and reward individuals and teams for their contributions to the successful implementation of change.					
122	Break down changes into manageable steps	Divide changes into smaller and manageable steps, making it easier for employees to gradually adapt. Celebrate every step of progress to build motivation and motivate employees.					
123	Lead by example	As a chief technology officer, as a role model, embrace change and demonstrate a willingness to learn and adapt. Show commitment to change initiatives to motivate others to follow suit.					

Leadership for sustainable growth of high tech Enterprises							
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
124	Monitoring and adjustment	Continuously monitor the progress of changes and prepare to adjust methods as needed. Maintain flexibility and responsiveness to feedback and constantly changing environments.					
Strategies for managing stakeholder expectations							
125	Open and transparent communication	Cultivate an open and transparent communication culture with stakeholders. Regularly provide progress on technical projects, including successes, challenges, and any changes in time or scope.					
126	Actively listening	Actively listen to the concerns, feedback, and expectations of stakeholders. Show empathy and understanding, and quickly					

Leadership for sustainable growth of high tech Enterprises							
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
		resolve any issues raised.					
127	Set realistic expectations	Timeline, costs, and potential outcomes of real-world technology plans. Avoid excessive commitment and insufficient delivery, as this may erode the trust of stakeholders.					
128	Establish clear goals and objectives	Clearly define the goals and objectives of technical projects based on the overall strategy of the organization. Ensure that stakeholders have a clear understanding of the project's purpose and expected outcomes.					
129	Engage stakeholders as early as possible	Engage stakeholders in the early stages of technology projects to gather their opinions and insights. Engaging stakeholders in the decision-making process can enhance their ownership and support.					

Leadership for sustainable growth of high tech Enterprises							
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
130	Provide demonstrations and progress reports	Provide technical solutions or prototype demonstrations to stakeholders to visualize potential benefits. Provide progress reports with measurable results to demonstrate the value of the project.					
131	Manage risks and issues	Proactively identify and manage risks and issues related to technical projects. Communicate mitigation plans to stakeholders to instill confidence in project management.					
132	Building trust and credibility	Demonstrate ability and expertise in technical issues to build trust and credibility with stakeholders. Respond reliably to their concerns.					
133	Resolve conflicts and differences of opinion	Predict conflicts and disagreements among stakeholders and constructively address these issues. Seek common ground and compromise to find the most suitable solution for the					

Leadership for sustainable growth of high tech Enterprises							
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
		organization's interests.					
134	Continuous engagement	Maintain continuous engagement with stakeholders throughout the entire project lifecycle. Seek their opinions at key decision points and ensure that their expectations are taken into account.					
135	Celebrate achievements	Celebrate project milestones and successes with stakeholders to strengthen their support and enthusiasm for future plans.					

Leadership for sustainable growth of high tech Enterprises							
Section 4 Prediction of the Future Role of chief technology officer							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
136	Focus on digital transformation	chief technology officer will take the lead in carrying out digital transformation work, guiding organizations to adopt emerging technologies and digital processes to improve efficiency and customer experience.					
137	Data-driven decision-making	chief technology officer will utilize data analysis and artificial intelligence to make informed, data-driven decisions to optimize business operations and drive growth. They will be responsible for identifying valuable insights from a large dataset to gain a competitive advantage.					
138	Leading position in cybersecurity	With the increasing prevalence of cyber threats, chief technology officer will play a crucial role in ensuring the soundness and up-to-date nature of the organization's cybersecurity measures. They					

Leadership for sustainable growth of high tech Enterprises							
Section 4 Prediction of the Future Role of chief technology officer							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
		will prioritize network security risk management to protect sensitive data and intellectual property.					
139	Sustainability and ethical technology adoption	chief technology officer will actively support sustainable and ethical technology practices, taking into account the environmental and social impacts of technology adoption. They will strive to achieve responsible artificial intelligence and data usage.					
140	Customer centric innovation	chief technology officer will promote customer-centric innovation by focusing on user experience and ensuring that technological solutions meet customer needs. They will be at the forefront of developing personalized and seamless digital experiences.					

Leadership for sustainable growth of high tech Enterprises							
Section 4 Prediction of the Future Role of chief technology officer							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
141	Agility and flexibility	chief technology officer will adopt agile methods and promote an adaptive culture to quickly respond to market changes and constantly changing customer needs.					
142	Collaboration with senior executives	chief technology officer will work closely with other executives, including the CEO, CFO, and CMO, to align technology strategy with broader business goals.					
143	Talent management and skill enhancement skills	chief technology officer will play an important role in attracting and retaining top technical talents, ensuring that employees have the opportunity to improve their skills and continue learning.					
144	Emphasize the innovation ecosystem	chief technology officer will explore partnerships, collaboration, and open innovation to create dynamic ecosystems, promote innovation, and acquire cutting-edge technologies.					

Leadership for sustainable growth of high tech Enterprises							
Section 4 Prediction of the Future Role of chief technology officer							
NO	Item	Definition	Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			5	4	3	2	1
145	Addressing Regulatory Challenges	chief technology officer will address complex regulatory environments and ensure compliance with data protection and privacy regulations.					

Expert Interview (EDFR Round 3)

Leadership for sustainable growth of high-tech enterprises in Guangxi Province

Clarification

This interview is intended as a tool for interviewing qualified personnel. The Round 2 of Leadership for sustainable growth of high-tech enterprises in Guangxi Province.

Your interview will help to create a questionnaire about the Leadership for sustainable growth of high-tech enterprises in Guangxi Province.

The interview consists of two parts:

Part 1: Information about the identity of qualified personnel.

Part 2: Interview questions about Leadership for sustainable growth of high-tech enterprises in Guangxi Province

Thank you for taking the time to fill in this questionnaire. The purpose of this questionnaire is to conduct a preliminary screening of the evaluation index system for the leadership of high-tech enterprises, hoping to give an objective judgment with the help of your knowledge and experience. The information you provided is only for the research of my doctor's thesis. We will strictly abide by the academic ethics and keep the information you provided confidential. Thank you for your support and cooperation.

Mr Lyu Gaizhi

Ph.D student in Technology
and Innovation Management

BanSomdej Chaopraya Rajaphat University

E-mail: 81539965@qq.com

Part 1: Information about the identity of qualified personnel

Please indicate the following information:

Name:

Educational Level

Job title

Position

Unit nature: institution University

Enterprise Government

Is it a registered cto: Yes No

Sex : Male Female

Age:

20-30 years

31-40 years

41-50 years

51-60 years

61-70 years

Years of working experience:

Part 2: The semi-open questionnaire

In each issue that all experts have given their opinions according to each question, the researcher will combine them into conclusions .Subsection as a hypothesis example below.

Leadership for sustainable growth of high tech Enterprises										
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
Technical expertise and vision										
1	Technical expertise	The technical expertise of chief technology officer is the foundation of their role. It involves in-depth knowledge and understanding of various technologies, systems, and tools related to the industry and operations of the organization. This expertise enables chief technology officer to make informed decisions, design powerful technical solutions, and provide strategic guidance to other teams.	4.00	1.00						

Leadership for sustainable growth of high tech Enterprises										
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
2	Evaluate emerging technologies	Technical expertise enables the chief technology officer to evaluate emerging technologies and assess their potential impact on the organization. They can identify trends, identify disruptive technologies, and recommend strategic investments to maintain a leading position in the competition	5.00	0.50						
3	Harnessing complex technological environments	In a rapidly evolving technological environment, the expertise of the chief technology officer enables them to navigate complex environments and make informed decisions. They ensure that the organization adopts the correct technology and continuously updates industry best practices.	5.00	1.00						

Leadership for sustainable growth of high tech Enterprises									
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
4	Addressing technical challenges	When faced with technical challenges, the expertise of the Chief Technical Officer comes into play to find effective solutions. They can solve problems, implement repair programs, and minimize disruptions to business operations.	5.00	1.00					
5	Promoting innovation	The technical expertise of the chief technology officer cultivates a culture of innovation within the organization. They inspire technical teams to explore new ideas and attempt to use cutting-edge technology to drive business innovation.	5.00	1.00					
Business acumen and strategic thinking									
6	Driving Technology Strategy	With their professional knowledge, chief technology officers can create and implement comprehensive technical strategies that are aligned with the overall goals	5.00	1.00					

Leadership for sustainable growth of high tech Enterprises										
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
		of the organization. They have identified opportunities to leverage technology to gain competitive advantage, optimize processes, and drive growth								
7	Understand business objectives	Business acumen can help chief technology officers understand the organization's goals and objectives. With these understandings, they can adjust their technological strategies and initiatives to support and strengthen the achievement of these goals.	5.00	1.00						
8	decision-making	Strategic thinking enables the chief technology officer to make wise and thoughtful decisions on technology investment, resource allocation, and project priorities. They can weigh the broader impact on the organization and consider potential risks and benefits.	3.00	1.00						

Leadership for sustainable growth of high tech Enterprises										
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
9	financial management	Business acumen enables the chief technology officer to effectively manage technology budgets. They can effectively allocate resources, optimize technology expenditures, and demonstrate the return on investment of technology plans.	4.00	1.00						
10	Market awareness	Strategic thinking includes maintaining an understanding of market trends, customer needs, and industry disruptions. The chief technology officer can use this knowledge to identify technology driven innovation opportunities that align with market demand.	5.00	1.00						
11	Value creation	Business intelligence allows chief technology officer to focus on creating value for the organization. They can determine how technology can improve products, services,	5.00	1.00						

Leadership for sustainable growth of high tech Enterprises										
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
		and processes to drive revenue growth and customer satisfaction.								
12	Reduce risk	Strategic thinking includes predicting potential risks and challenges. The chief technology officer can develop contingency plans to mitigate risks related to technology implementation, cybersecurity, and data privacy.	3.00	1.00						
13	Innovation consistency	Business intelligence ensures that technology driven innovation is aligned with the overall business strategy of the organization. The chief technology officer can prioritize innovative efforts to provide competitive advantage and drive growth.	5.00	1.00						

Leadership for sustainable growth of high tech Enterprises									
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
14	Cross functional collaboration	Strategic thinking promotes collaboration with other executives and department heads. The chief technology officer can collaborate with different stakeholders to align technology plans with broader business objectives.	4.00	1.00					
15	Opportunity assessment	Business intelligence enables the chief technology officer to evaluate new opportunities for adoption. They can identify areas where technology can optimize processes, reduce costs, and improve overall efficiency.	4.00	1.00					
16	Long term planning	Strategic thinking includes long-term planning and envisioning the future of the organization. The chief technology officer can develop a technology roadmap that is consistent with the organization's long-term vision and support its development trajectory.	5.00	1.00					

Leadership for sustainable growth of high tech Enterprises									
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
17	performance evaluation	Business acumen allows chief technology officer to evaluate the effectiveness of technical plans. They can use key performance indicators (KPIs) to measure results and adjust strategies accordingly.	5.00	1.00					
18	A customer-centric approach	Strategic thinking helps chief technology officer adopt a customer-centric approach to technology development. They can prioritize technical solutions that meet customer needs and enhance the overall customer experience.	5.00	1.00					
19	competitive edge	Business acumen allows the chief technology officer to identify opportunities to gain competitive advantage through technological differentiation and innovation.	5.00	1.00					
Collaboration and team building									

Leadership for sustainable growth of high tech Enterprises										
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
20	Cross functional collaboration (chief technology officer works closely with other executives)	Collaboration allows chief technology officers to work closely with other executives, such as the CEO, CFO, COO, and CMO, to align technology strategies with broader business goals. By collaborating with different departments, chief technology officer ensures that technical solutions support the organization.	5.00	1.00						
21	Collaboration with technical team	Technical expertise allows chief technology officer to have meaningful discussions with the technical team. They can provide guidance, guidance, and support to promote a collaborative and productive work environment.	4.00	1.00						
22	Effective communication	Collaboration requires effective communication skills. The chief technology officer must communicate technical concepts and strategies in a clear and concise manner to	5.00	1.00						

Leadership for sustainable growth of high tech Enterprises										
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NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
		stakeholders at all levels of the organization, including non-technical personnel.								
23	Establish a high-performance team	Team building is crucial for forming and cultivating high-performance technical teams. The Chief Technical Officer is responsible for identifying and recruiting top talent, cultivating a positive work culture, and encouraging teamwork and camaraderie among team members.	4.00	1.00						
24	Encourage team innovation	Collaboration creates an environment where team members are willing to share ideas and contribute to innovation. The chief technology officer encourages and values the opinions of team members, leading to breakthroughs and creative solutions.	5.00	1.00						

Leadership for sustainable growth of high tech Enterprises									
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NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
25	Authorize team members	The Chief Technical Officer authorizes team members to assume their own roles and responsibilities. By providing autonomy and trust, chief technology officer cultivates a sense of ownership and responsibility among team members.	4.00	1.00					
26	Guidance and professional development	Collaboration and team building enable the Chief Technical Officer to guide and support the professional development of team members. This includes providing training opportunities, career development guidance, and guidance.	4.00	2.00					
27	Conflict team resolution	In a collaborative work environment, conflicts may arise. The Chief Technical Officer must be proficient in conflict resolution and mediation to ensure that issues are quickly	4.00	1.00					

Leadership for sustainable growth of high tech Enterprises									
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
		and constructively resolved.							
28	Ensure team diversity and inclusivity	Collaboration and team building promote diversity and inclusiveness within the technical team. The chief technology officer ensures that different perspectives are valued and maintains an inclusive work environment.	5.00	1.00					
29	Adaptive leadership	Collaboration requires employees to possess adaptive leadership skills. The Chief Technical Officer must provide flexible and open feedback, adjusting their leadership style to meet the needs and preferences of different team members.	5.00	1.00					
30	Encourage open communication within the team	Team building involves creating an atmosphere of open communication and trust. The chief technology officer has developed an environment where team members are	5.00	1.00					

Leadership for sustainable growth of high tech Enterprises										
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			Median	IQR	5	4	3	2	1	
		willing to express their opinions and concerns.								
31	Commending achievements	The Chief Technical Officer recognizes and celebrates the achievements of individual team members and the entire team. Recognizing one's achievements can boost morale and motivate team members to stand out.	4.00	1.00						
32	Promoting knowledge sharing	Collaboration and team building encourage knowledge sharing among team members. The Chief Technical Officer provides team members with the opportunity to share professional knowledge, best practices, and lessons learned.	5.00	2.00						
Adaptability and resilience in high-tech environments										

Leadership for sustainable growth of high tech Enterprises									
Section 1 The qualities and abilities that chief technology officers in high-tech enterprises should possess									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
33	Dynamic technology landscape (closely following technology hotspots)	The high-tech industry has experienced frequent technological progress and innovation. The chief technology officer must adapt to these changes and constantly update their knowledge and skills to maintain relevance and effectively lead technology initiatives.	5.00	1.00					
34	Agile decision-making	In a high-tech environment, market conditions and customer needs can rapidly change. The adaptability of the chief technology officer enables them to make quick and wise decisions and quickly respond to emerging opportunities and challenges.	5.00	1.00					
35	Embrace subversion	The high-tech industry is easily influenced by disruptive technologies that may reshape the market. The flexibility of the chief technology officer enables them to accept	4.00	1.00					

Leadership for sustainable growth of high tech Enterprises										
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NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
		interruptions and identify opportunities to utilize these technologies for the benefit of the organization.								
36	Navigation uncertainty (overcoming uncertainty)	Uncertainty is widely present in the high-tech field, such as changes in regulations, geopolitical factors, and economic fluctuations. The flexibility of the chief technology officer enables them to overcome uncertainty while maintaining a focus on the organization's long-term vision.	5.00	1.00						
37	Rotation strategy	The adaptability of the chief technology officer enables them to shift to technology strategies when necessary. They can shift their focus based on market trends and customer needs, ensuring that technical solutions align with business goals.	4.00	1.00						

Leadership for sustainable growth of high tech Enterprises									
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			Median	IQR	5	4	3	2	1
38	Experimentation and Innovation	Flexibility encourages chief technology officer to cultivate a culture of experimentation and innovation within the organization. By accepting calculated risks, the chief technology officer can drive technology driven initiatives, thereby creating a competitive advantage.	5.00	1.00					
39	Resolve failed issues	In the high-tech field, not all initiatives can be successful. The flexibility of the chief technology officer enables them to view failure as a learning opportunity and adjust strategies to improve future outcomes.	5.00	0.50					
40	Technical Implementation Challenges	Implementing new technologies may bring unforeseen challenges. The adaptability of the Chief Technical Officer enables them to adjust implementation plans and effectively overcome obstacles.	5.00	1.00					

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NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
41	Talent retention and development	The high-tech field is highly competitive for top technical talents. The flexibility of the chief technology officer enables them to develop strategies to retain and cultivate the best talents, ensuring the organization's ability to innovate and grow.	3.00	1.00					
42	Dealing with market fluctuations	The high-tech industry is susceptible to market fluctuations and disruptive trends. The flexibility of the chief technology officer enables them to withstand market fluctuations, positioning the organization for long-term success.		1.00					
43	Leading through change	In a fast-paced high-tech environment, the resilience of the chief technology officer enables them to effectively lead change. They maintain a positive perspective, motivate the entire team, and unite the entire organization around	5.00	1.00					

Leadership for sustainable growth of high tech Enterprises										
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			Median	IQR	5	4	3	2	1	
		common goals.								
44	Continuous learning	Adaptability and resilience drive chief technology officer to engage in continuous learning and professional development. Continuously understanding the latest trends and best practices can improve chief technology officer's efficiency as a technology leader.	5.00	1.00						
Cultivate innovation and research and development										
45	Ability to obtain information	The ability to acquire relevant knowledge in this field, especially cutting-edge knowledge related to the development direction of this field, through multiple channels	5.00	1.00						
46	Inferential	The ability to understand and reason about a thing by	5.00	1.00						

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	innovation ability	breaking it down into several parts or describing its internal connections through layers of causal relationships, thus innovating on the basis of that thing								
47	Project risk identification and control capabilities	Able to identify risks in the project and take measures to control them	5.00	1.00						
48	Research decision-making ability	Able to grasp the project from a macro perspective and determine its feasibility based on the information obtained	4.00	1.00						
49	Experimental observation ability	Pay attention to the operation of the project and be able to keenly observe the fluctuations in project operation	4.00	1.00						
50	Creating an Innovative Culture	Creating an innovative culture can cultivate creativity, drive continuous improvement, and drive the growth and success of an organization. As a chief technology officer,	4.00	1.00						

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			Median	IQR	5	4	3	2	1	
		establishing an innovation culture within the technical team and the entire organization is a key responsibility.								
51	Manage intellectual property and patent capabilities	By effectively managing intellectual property and patents, the chief technology officer ensures that the organization's technological innovation is protected, leverages competitive advantages, and contributes to its long-term success in the high-tech field.	4.00	1.00						
52	Integrating research and development with business objectives	For the chief technology officer (chief technology officer), it is crucial to align research and development (R&D) with business goals to ensure that technology plans align with organizational strategic goals and contribute to their long-term success. By effectively combining research and development with business objectives, chief technology	5.00	1.00						

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			Median	IQR	5	4	3	2	1	
		officer can drive innovation, optimize resource allocation, and maximize the value of technology investment.								
Addressing regulatory and compliance challenges										
53	Ensure safety and compliance	Having a deep understanding of network security and data protection, ensuring that the organization's technical systems and data are secure and comply with relevant regulations.	4.00	1.00						
54	Addressing data privacy and security issues	In the era of widespread digital leaks and cyber threats, addressing data privacy and security issues is crucial for chief technology officers (chief technology officers). As the custodian of technology infrastructure and data management, chief technology officer plays a crucial role in	4.00	1.00						

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NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
		ensuring that the organization's data remains protected and complies with privacy regulations.								
55	Comply with industry standards and regulations	Compliance with industry standards and regulations is a key responsibility of the chief technology officer (chief technology officer) to ensure that organizations comply with legal requirements, industry best practices, and ethical guidelines. Failure to comply with these standards may result in legal liability, reputation damage, and operational interruption.	4.00	1.00						

Leadership for sustainable growth of high tech Enterprises									
Section 2 Sustainable development strategies that high-tech enterprises need to possess									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
Environmental Sustainability Initiative									
56	energy efficiency	Promote the adoption of energy-saving technologies and practices within the organization. This includes optimizing the data center, using energy-efficient hardware, and implementing power management strategies for devices.	5.00	1.00					
57	renewable energy	Explore opportunities for transitioning to renewable energy, such as solar, wind, or hydroelectric power, to power the organization's operations and reduce carbon emissions.	4.00	1.00					
58	Green IT procurement	Prioritize the procurement of environmentally friendly IT equipment to ensure that hardware and components comply with recognized environmental standards, such as Energy Star certification.	5.00	1.00					

Leadership for sustainable growth of high tech Enterprises									
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NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
59	Circular Economy Practice	Extend the service life of IT equipment through maintenance, refurbishment, and recycling, embracing the principles of circular economy. Promote responsible electronic waste management and collaborate with certified recycling suppliers.	5.00	1.00					
60	Virtualization and Cloud Computing	Encourage the adoption of virtualization and cloud computing to optimize resource utilization and reduce the physical footprint of IT infrastructure.	4.00	1.00					
61	Carbon footprint tracking	Implement a system to track and measure the organization's carbon footprint. Regularly evaluate and report on carbon emissions to identify areas for improvement.	4.00	1.00					

Leadership for sustainable growth of high tech Enterprises									
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NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
62	Sustainable software development	Encourage sustainable practices in software development, such as optimizing code to reduce energy consumption and minimize digital waste.	4.00	1.00					
63	Remote work and remote work	Promote the choice of remote work and remote work to reduce carbon emissions related to commuting and promote healthier work life balance for employees.	4.00	1.00					
64	Paperless Initiative	Promote paperless practices within organizations by encouraging digital documents, electronic signatures, and electronic communication.	5.00	1.00					
65	Employee Education and Participation	Educate employees on environmental sustainability and encourage them to actively participate in green initiatives. Carry out promotional activities and involve employees in	3.00	1.00					

Leadership for sustainable growth of high tech Enterprises										
Section 2 Sustainable development strategies that high-tech enterprises need to possess										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
		sustainable development projects.								
66	Green Data Center	Optimize data center operations to reduce energy consumption and waste. Consider energy-saving cooling solutions and utilize advanced power management tools.	3.00	1.00						
67	Green Building and Facility Management	If applicable, implement green building practices and sustainable facility management to reduce the overall environmental impact of the organization.	4.00	1.00						
68	Environmental certification	Strive to obtain recognized environmental certifications, such as LEED (Leadership in Energy and Environmental Design) or ISO 14001, to demonstrate the organization's commitment to sustainable development.	5.00	1.00						

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NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
Social Responsibility and Moral Practice									
69	Corporate Social Responsibility (CSR) Strategy	Collaborate with company leaders to develop a comprehensive corporate social responsibility strategy that aligns with organizational values and mission. Incorporate social and ethical considerations into technological decision-making.	4.00	1.00					
70	Ethical Technology Use	Ensure that technical solutions and applications adhere to ethical standards and respect user privacy and data security. Implement strict data protection measures to protect customer information.	4.00	1.00					

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Section 2 Sustainable development strategies that high-tech enterprises need to possess									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
71	Inclusive design	Advocate inclusive design practices to cater to different user groups and consider accessibility needs. Ensure that all individuals have access to and use technology products and services.	4.00	1.00					
72	Environmental sustainability	Promote environmental sustainability initiatives and implement environmental practices in technology operations. This includes adopting energy-saving technologies, reducing electronic waste, and promoting sustainable IT practices.	5.00	1.00					
73	diversity and inclusion	Winning championships, diversity, and inclusivity within the technical team and the entire organization. Encourage different recruitment practices and create an inclusive work	4.00	1.00					

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Section 2 Sustainable development strategies that high-tech enterprises need to possess										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
		environment that values different perspectives.								
74	Ethical supply chain	Collaborate with suppliers and suppliers to ensure ethical practices throughout the entire supply chain. Prioritize cooperation with suppliers who adhere to fair labor practices and sustainable procurement.	5.00	1.00						
75	Responsible innovation	Cultivate a responsible innovation culture where technological initiatives consider potential social and ethical impacts. Predict and address any unexpected consequences of technical solutions.	5.00	1.00						
76	transparency and accountability	Practice transparency in technical operations and decision-making. Responsible for addressing the impact of	4.00	1.00						

Leadership for sustainable growth of high tech Enterprises										
Section 2 Sustainable development strategies that high-tech enterprises need to possess										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
		technological initiatives on society, customers, and stakeholders.								
77	Ethical artificial intelligence and data ethics	Promote the ethical use of artificial intelligence (AI) and data ethics. Develop responsible guidelines for artificial intelligence deployment and data processing, taking into account potential biases and privacy issues.	5.00	1.00						
78	Ethical standards and code of conduct	Develop and implement ethical standards and codes of conduct for the technical team. Ensure employees are aware of ethical expectations and follow best practices.	5.00	1.00						
79	Human rights and labor practices	Ensure that the organization's technical operations uphold human rights and fair labor practices. Avoid engaging in projects that lead to human rights violations or unethical	4.00	1.00						

Leadership for sustainable growth of high tech Enterprises										
Section 2 Sustainable development strategies that high-tech enterprises need to possess										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
		labor practices.								
80	Stakeholder engagement	Engage with stakeholders, including customers, employees, investors, and the community, understand their concerns, and incorporate their feedback into technical strategies.	5.00	1.00						
Economic sustainability and long-term feasibility										
81	Business Model Assessment	Collaborate with business leaders to evaluate the organization's current business model and identify opportunities for improvement. Ensure consistency between technology plans and the organization's revenue generation and cost optimization strategies.	4.00	1.00						

Leadership for sustainable growth of high tech Enterprises									
Section 2 Sustainable development strategies that high-tech enterprises need to possess									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
82	Financial planning and budgeting	Work closely with the finance team to create realistic financial plans and budgets, and strategically allocate resources in technical projects. Prioritize plans with clear paths to generate value and return on investment (ROI).	4.00	1.00					
83	Profitability and cost control	Focus on improving profitability and optimizing operating costs. Assess technology related costs and explore opportunities for cost savings through automation, process improvement, and resource optimization.	5.00	1.00					
84	Market analysis and trends	Stay up-to-date with market trends, customer preferences, and emerging technologies. Utilize market insights to guide technical decisions and ensure that the organization remains competitive and relevant.	5.00	1.00					

Leadership for sustainable growth of high tech Enterprises									
Section 2 Sustainable development strategies that high-tech enterprises need to possess									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
85	Diversification of income streams	Encourage the use of organizational technological capabilities to explore new revenue streams and business opportunities. Diversification reduces dependence on a single source of income and enhances financial stability.	4.00	1.00					
86	risk management	Identify potential economic risks, such as market fluctuations, regulatory changes, or supply chain disruptions, and develop risk management strategies to mitigate their impact on the organization.	5.00	1.00					
87	Long term innovation investment	Balancing short-term technological initiatives with long-term investment in innovation. Cultivate a culture of continuous improvement, research and development (R&D) to drive sustainable growth.	5.00	1.00					

Leadership for sustainable growth of high tech Enterprises									
Section 2 Sustainable development strategies that high-tech enterprises need to possess									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
88	Agility and adaptability	Promote agility and adaptability within the technical team to quickly respond to constantly changing market conditions and customer needs. Adopting agile methods to ensure that technical plans remain relevant and flexible.	5.00	1.00					
89	Strategic partnership	Explore strategic partnerships and collaborations with other organizations to leverage complementary technologies and expand market reach.	4.00	1.00					
90	Talent management and retention	Invest in talent management programs to attract and retain top technical professionals. A skilled and proactive workforce helps drive innovation and maintain long-term viability.	5.00	1.00					

Leadership for sustainable growth of high tech Enterprises									
Section 2 Sustainable development strategies that high-tech enterprises need to possess									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
91	Environmental and Social Responsibility	Embrace sustainable development initiatives and corporate social responsibility practices. Demonstrating commitment to environmental and social issues can enhance an organization's reputation and appeal to stakeholders.	5.00	1.00					
92	Continuous monitoring and evaluation	Regularly monitor and evaluate the performance of technical plans based on economic goals. Use data-driven insights to make informed decisions and adjust strategies as needed.	4.00	1.00					

Leadership for sustainable growth of high tech Enterprises									
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
Key steps to fully utilize emerging technologies									
93	Technical Landscape Analysis	Conduct a comprehensive analysis of the current technological landscape, including market trends, emerging technologies, and potential disruptions. Please stay updated on the progress in various technical fields.	4.00	1.00					
94	Strategic coordination	Coordinate technology plans with the organization's long-term strategic goals. Identify areas where emerging technologies can support business goals and create competitive advantages	3.00	1.00					
95	Innovative mindset	Cultivate an innovative mindset within the technical team. Encourage creative thinking, experimentation, and	5.00	1.00					

Leadership for sustainable growth of high tech Enterprises										
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
		willingness to explore new ideas and technologies.								
96	pilot project	Implement pilot projects to test and evaluate the feasibility and potential impact of emerging technologies. Use a concept validation plan to evaluate feasibility and scalability.	5.00	1.00						
97	Collaboration and Partnership	Collaborate with external partners such as startups, research institutions, and technology suppliers to gain a deeper understanding of cutting-edge technologies and explore collaboration opportunities.	4.00	1.00						
98	Data-driven decision-making	Technical decisions based on data-driven insights and performance metrics. Utilize analysis and market research to support the adoption of emerging technologies.	4.00	1.00						

Leadership for sustainable growth of high tech Enterprises									
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
99	Talent acquisition and development	Invest in talent acquisition and development, and establish a skilled workforce that can effectively utilize emerging technologies.	5.00	1.00					
100	Risk and Security Management	Assess the risks associated with adopting emerging technologies and develop risk management strategies. Prioritize data security and privacy considerations.	5.00	1.00					
101	Scalability and flexibility	Evaluate the scalability and flexibility of emerging technologies to ensure they can meet future organizational needs and adapt to constantly changing market demands.	4.00	1.00					
102	Regulatory compliance	Continuously updating regulations and compliance requirements related to emerging technologies. Ensure that the organization complies with relevant laws and industry	5.00	1.00					

Leadership for sustainable growth of high tech Enterprises									
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
		standards.							
103	Technical roadmap	Develop a technology roadmap outlining the integration and deployment of emerging technologies. The plan is implemented in stages to minimize interruptions.	5.00	1.00					
104	User centric approach	When implementing emerging technologies, a user centric approach should be adopted. Focusing on creating value for customers and enhancing user experience.	5.00	1.00					
105	Continuous evaluation and improvement	Continuously evaluate the impact of the adopted technology on organizational goals. Be prepared to adjust strategies based on feedback and performance results.	5.00	1.00					
Key steps to fully utilize data analysis and decision-making									

Leadership for sustainable growth of high tech Enterprises									
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
106	Visualization and Communication	Utilize data visualization tools to provide insights to stakeholders in a clear and actionable format. Communicate the research results of the data analysis plan to key decision-makers to influence strategic choices.	4.00	1.00					
107	Predictive analysis for prediction	Use predictive analysis to predict future trends, market demand, and customer behavior. Use predictive models to identify potential risks and opportunities, enabling organizations to proactively respond to challenges.	5.00	1.00					
108	Real time analysis of agility	Implement real-time analysis function to achieve agile decision-making. Real time insight allows organizations to quickly respond to constantly changing situations.	5.00	1.00					

Leadership for sustainable growth of high tech Enterprises									
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
109	Ethical considerations	Ensure that the data analysis process complies with ethical standards, especially in terms of data privacy and protection. Responsible and transparent use of data to build trust with customers and stakeholders.	4.00	1.00					
110	Continuous improvement	Embrace a culture of continuous improvement in data analysis practices. Regularly review and optimize the data analysis process to improve its effectiveness.	4.00	1.00					
Strategies to overcome the resistance of sustainable reform in enterprises									
111	effective communication	Clearly and transparently communicate the fundamental principles behind change, explain how it aligns with the organization's goals, and benefit all stakeholders. Open resolution of concerns and issues, regularly providing	5.00	1.00					

Leadership for sustainable growth of high tech Enterprises										
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
		updates on changes and progress.								
112	Early engagement with stakeholders	Engage key stakeholders from the beginning of the change process, including employees, managers, and department heads. Seek their opinions, listen to their feedback, and incorporate their ideas into the change plan.	4.00	1.00						
113	Create a shared vision	Develop a shared vision for change, resonate with employees, and motivate them to support the initiative. Emphasize the positive impact of change on individuals and organizations.	5.00	1.00						
114	Authorize change agents	Identify change advocates within the organization who can advocate for change and actively influence others.	4.00	1.00						

Leadership for sustainable growth of high tech Enterprises										
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
		Authorize change agents to lead by example and share success stories.								
115	Provide training and support	Provide training and development projects to help employees develop the skills needed to successfully adapt to change. Provide continuous support and resources to ensure employees feel confident in implementing change.	5.00	1.00						
116	Addressing Fear and Uncertainty	Acknowledging that change may be unsettling and openly and generously addressing employees' fears and concerns. Provide assurance and support throughout the entire transition process.	4.00	1.00						
117	Celebrate Rapid Victory	Identify and celebrate rapid victories to showcase positive results of early changes in the process. Recognize and	5.00	1.00						

Leadership for sustainable growth of high tech Enterprises										
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
		reward individuals and teams for their contributions to the successful implementation of change.								
118	Break down changes into manageable steps	Divide changes into smaller and manageable steps, making it easier for employees to gradually adapt. Celebrate every step of progress to build motivation and motivate employees.	5.00	1.00						
119	Lead by example	As a chief technology officer, as a role model, embrace change and demonstrate a willingness to learn and adapt. Show commitment to change initiatives to motivate others to follow suit.	4.00	1.00						
120	Monitoring and adjustment	Continuously monitor the progress of changes and prepare to adjust methods as needed. Maintain flexibility and	4.00	1.00						

Leadership for sustainable growth of high tech Enterprises										
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
		responsiveness to feedback and constantly changing environments.								
Strategies for managing stakeholder expectations										
121	Open and transparent communication	Cultivate an open and transparent communication culture with stakeholders. Regularly provide progress on technical projects, including successes, challenges, and any changes in time or scope.	5.00	1.00						
122	Actively listening	Actively listen to the concerns, feedback, and expectations of stakeholders. Show empathy and understanding, and quickly resolve any issues raised.	5.00	1.00						
123	Set realistic	Timeline, costs, and potential outcomes of real-world	4.00	1.00						

Leadership for sustainable growth of high tech Enterprises										
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
	expectations	technology plans. Avoid excessive commitment and insufficient delivery, as this may erode the trust of stakeholders.								
124	Establish clear goals and objectives	Clearly define the goals and objectives of technical projects based on the overall strategy of the organization. Ensure that stakeholders have a clear understanding of the project's purpose and expected outcomes.	4.00	1.00						
125	Engage stakeholders as early as possible	Engage stakeholders in the early stages of technology projects to gather their opinions and insights. Engaging stakeholders in the decision-making process can enhance their ownership and support.	3.00	1.00						

Leadership for sustainable growth of high tech Enterprises									
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
126	Provide demonstrations and progress reports	Provide technical solutions or prototype demonstrations to stakeholders to visualize potential benefits. Provide progress reports with measurable results to demonstrate the value of the project.	4.00	1.00					
127	Manage risks and issues	Proactively identify and manage risks and issues related to technical projects. Communicate mitigation plans to stakeholders to instill confidence in project management.	5.00	1.00					
128	Building trust and credibility	Demonstrate ability and expertise in technical issues to build trust and credibility with stakeholders. Respond reliably to their concerns.	4.00	1.00					
129	Resolve conflicts and differences of	Predict conflicts and disagreements among stakeholders and constructively address these issues. Seek common	4.00	1.00					

Leadership for sustainable growth of high tech Enterprises										
Section 3 chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
	opinion	ground and compromise to find the most suitable solution for the organization's interests.								
130	Continuous engagement	Maintain continuous engagement with stakeholders throughout the entire project lifecycle. Seek their opinions at key decision points and ensure that their expectations are taken into account.	3.00	1.00						
131	Celebrate achievements	Celebrate project milestones and successes with stakeholders to strengthen their support and enthusiasm for future plans.	5.00	1.00						

Leadership for sustainable growth of high tech Enterprises									
Section 4 Prediction of the Future Role of chief technology officer									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
132	Focus on digital transformation	chief technology officer will take the lead in carrying out digital transformation work, guiding organizations to adopt emerging technologies and digital processes to improve efficiency and customer experience.	4.00	1.00					
133	Data-driven decision-making	chief technology officer will utilize data analysis and artificial intelligence to make informed, data-driven decisions to optimize business operations and drive growth. They will be responsible for identifying valuable insights from a large dataset to gain a competitive advantage.	4.00	1.00					

Leadership for sustainable growth of high tech Enterprises									
Section 4 Prediction of the Future Role of chief technology officer									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
134	Leading position in cybersecurity	With the increasing prevalence of cyber threats, chief technology officer will play a crucial role in ensuring the soundness and up-to-date nature of the organization's cybersecurity measures. They will prioritize network security risk management to protect sensitive data and intellectual property.	5.00	1.00					
135	Sustainability and ethical technology adoption	chief technology officer will actively support sustainable and ethical technology practices, taking into account the environmental and social impacts of technology adoption. They will strive to achieve responsible artificial intelligence and data usage.	4.00	1.00					

Leadership for sustainable growth of high tech Enterprises										
Section 4 Prediction of the Future Role of chief technology officer										
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent					
			Median	IQR	5	4	3	2	1	
136	Customer centric innovation	chief technology officer will promote customer-centric innovation by focusing on user experience and ensuring that technological solutions meet customer needs. They will be at the forefront of developing personalized and seamless digital experiences.	4.00	1.00						
137	Agility and flexibility	chief technology officer will adopt agile methods and promote an adaptive culture to quickly respond to market changes and constantly changing customer needs.	5.00	1.00						
138	Collaboration with senior executives	chief technology officer will work closely with other executives, including the CEO, CFO, and CMO, to align technology strategy with broader business goals.	3.00	1.00						

Leadership for sustainable growth of high tech Enterprises									
Section 4 Prediction of the Future Role of chief technology officer									
NO	Item	Definition	Results of Round 2		Evaluate the degree of compliance. 5 is very consistent, 1 is very inconsistent				
			Median	IQR	5	4	3	2	1
139	Talent management and skill enhancement skills	chief technology officer will play an important role in attracting and retaining top technical talents, ensuring that employees have the opportunity to improve their skills and continue learning.	4.00	1.00					
140	Emphasize the innovation ecosystem	chief technology officer will explore partnerships, collaboration, and open innovation to create dynamic ecosystems, promote innovation, and acquire cutting-edge technologies.	5.00	1.00					
141	Addressing Regulatory Challenges	chief technology officer will address complex regulatory environments and ensure compliance with data protection and privacy regulations.	5.00	0.00					

Appendix D

The Results of the Round 1 and Round 2

Round1

Technical expertise and vision	Freq	Pct	Sugg
1.Technical expertise: The technical expertise of chief technology officer is the foundation of their role. It involves in-depth knowledge and understanding of various technologies, systems, and tools related to the industry and operations of the organization. This expertise enables chief technology officer to make informed decisions, design powerful technical solutions, and provide strategic guidance to other teams.	17	100%	None
2.Evaluate emerging technologies: Technical expertise enables the chief technology officer to evaluate emerging technologies and assess their potential impact on the organization. They can identify trends, identify disruptive technologies, and recommend strategic investments to maintain a leading position in the competition	17	100%	None
3.Harnessing complex technological environments: In a rapidly evolving technological environment, the expertise of the chief technology officer enables them to navigate complex environments and make informed decisions. They ensure that the organization adopts the correct technology and continuously updates industry best practices.	16	94.12%	None
4.Building Scalable Solutions: chief technology officer's technical expertise enables them to design scalable and future-oriented solutions to adapt to the growth and constantly changing needs of the organization. They ensure that the technological infrastructure and systems can handle the growing demand.	16	94.12%	None
5.Addressing technical challenges: When faced with technical challenges, the expertise of the Chief	16	94.12%	None

Technical expertise and vision	Freq	Pct	Sugg
Technical Officer comes into play to find effective solutions. They can solve problems, implement repair programs, and minimize disruptions to business operations.			
6.Promoting innovation: The technical expertise of the chief technology officer cultivates a culture of innovation within the organization. They inspire technical teams to explore new ideas and attempt to use cutting-edge technology to drive business innovation.	15	88.24%	None
7.Driving Technology Strategy: With their professional knowledge, chief technology officers can create and implement comprehensive technical strategies that are aligned with the overall goals of the organization. They have identified opportunities to leverage technology to gain competitive advantage, optimize processes, and drive growth	17	100%	None
8.Understand business objectives: Business acumen can help chief technology officers understand the organization's goals and objectives. With these understandings, they can adjust their technological strategies and initiatives to support and strengthen the achievement of these goals.	17	100%	None
9.decision-making: Strategic thinking enables the chief technology officer to make wise and thoughtful decisions on technology investment, resource allocation, and project priorities. They can weigh the broader impact on the organization and consider potential risks and benefits.	16	94.12%	None
10.financial management: Business acumen enables the chief technology officer to effectively manage technology budgets. They can effectively allocate resources, optimize technology expenditures, and	17	100%	None

Technical expertise and vision	Freq	Pct	Sugg
demonstrate the return on investment of technology plans.			
11.Market awareness: Strategic thinking includes maintaining an understanding of market trends, customer needs, and industry disruptions. The chief technology officer can use this knowledge to identify technology driven innovation opportunities that align with market demand.	16	94.12%	None
12.Value creation: Business intelligence allows chief technology officer to focus on creating value for the organization. They can determine how technology can improve products, services, and processes to drive revenue growth and customer satisfaction.	17	100%	None

Business acumen and strategic thinking	Freq	Pct	Sugg
13.Reduce risk: Strategic thinking includes predicting potential risks and challenges. The chief technology officer can develop contingency plans to mitigate risks related to technology implementation, cybersecurity, and data privacy.	16	94.12%	None
14.Innovation consistency: Business intelligence ensures that technology driven innovation is aligned with the overall business strategy of the organization. The chief technology officer can prioritize innovative efforts to provide competitive advantage and drive growth.	15	88.24%	None
15.Cross functional collaboration: Strategic thinking promotes collaboration with other executives and department heads. The chief technology officer can collaborate with different stakeholders to align technology plans with broader business objectives.	15	88.24%	None
16.Opportunity assessment: Business intelligence	15	88.24%	None

Business acumen and strategic thinking	Freq	Pct	Sugg
enables the chief technology officer to evaluate new opportunities for adoption. They can identify areas where technology can optimize processes, reduce costs, and improve overall efficiency.			
17.Long term planning: Strategic thinking includes long-term planning and envisioning the future of the organization. The chief technology officer can develop a technology roadmap that is consistent with the organization's long-term vision and support its development trajectory.	17	100%	None
18.performance evaluation: Business acumen allows chief technology officer to evaluate the effectiveness of technical plans. They can use key performance indicators (KPIs) to measure results and adjust strategies accordingly.	17	100%	None
19.A customer-centric approach: Strategic thinking helps chief technology officer adopt a customer-centric approach to technology development. They can prioritize technical solutions that meet customer needs and enhance the overall customer experience.	17	100%	None

Collaboration and team building	Freq	Pct	Sugg
20.competitive edge: Business acumen allows the chief technology officer to identify opportunities to gain competitive advantage through technological differentiation and innovation.	17	100%	None
21.Cross functional collaboration (chief technology officer works closely with other executives): Collaboration allows chief technology officers to work closely with other executives, such as the CEO, CFO, COO, and CMO, to align technology strategies with broader business goals. By collaborating with different	15	88.24%	None

Collaboration and team building	Freq	Pct	Sugg
departments, chief technology officer ensures that technical solutions support the organization.			
22.Collaboration with technical team: Technical expertise allows chief technology officer to have meaningful discussions with the technical team. They can provide guidance, guidance, and support to promote a collaborative and productive work environment.	16	94.12%	None
23.Effective communication: Collaboration requires effective communication skills. The chief technology officer must communicate technical concepts and strategies in a clear and concise manner to stakeholders at all levels of the organization, including non-technical personnel.	17	100%	None
24.Establish a high-performance team: Team building is crucial for forming and cultivating high-performance technical teams. The Chief Technical Officer is responsible for identifying and recruiting top talent, cultivating a positive work culture, and encouraging teamwork and camaraderie among team members.	16	94.12%	None
25.Encourage team innovation: Collaboration creates an environment where team members are willing to share ideas and contribute to innovation. The chief technology officer encourages and values the opinions of team members, leading to breakthroughs and creative solutions.	17	100%	None
26.Authorize team members: The Chief Technical Officer authorizes team members to assume their own roles and responsibilities. By providing autonomy and trust, chief technology officer cultivates a sense of ownership and responsibility among team members.	17	100%	None
27.Guidance and professional development: Collaboration and team building enable the Chief	16	94.12%	None

Collaboration and team building	Freq	Pct	Sugg
Technical Officer to guide and support the professional development of team members. This includes providing training opportunities, career development guidance, and guidance.			
28.Conflict team resolution: In a collaborative work environment, conflicts may arise. The Chief Technical Officer must be proficient in conflict resolution and mediation to ensure that issues are quickly and constructively resolved.	17	100%	None
29.Ensure team diversity and inclusivity: Collaboration and team building promote diversity and inclusiveness within the technical team. The chief technology officer ensures that different perspectives are valued and maintains an inclusive work environment.	15	88.24%	None
30.Adaptive leadership: Collaboration requires employees to possess adaptive leadership skills. The Chief Technical Officer must provide flexible and open feedback, adjusting their leadership style to meet the needs and preferences of different team members.	16	94.12%	None
31.Encourage open communication within the team: Team building involves creating an atmosphere of open communication and trust. The chief technology officer has developed an environment where team members are willing to express their opinions and concerns.	17	100%	None
32.Commending achievements: The Chief Technical Officer recognizes and celebrates the achievements of individual team members and the entire team. Recognizing one's achievements can boost morale and motivate team members to stand out.	15	88.24%	None
33.Promoting knowledge sharing: Collaboration and team building encourage knowledge sharing among team members. The Chief Technical Officer provides	16	94.12%	None

Collaboration and team building	Freq	Pct	Sugg
team members with the opportunity to share professional knowledge, best practices, and lessons learned.			
34.Shared goals and vision: Collaboration ensures that all team members are aligned with the organization's goals and technical vision. The chief technology officer ensures that the team's efforts are synchronized with broader goals.	17	100%	None

Adaptability and resilience in high-tech environments	Freq	Pct	Sugg
35.Dynamic technology landscape (closely following technology hotspots): The high-tech industry has experienced frequent technological progress and innovation. The chief technology officer must adapt to these changes and constantly update their knowledge and skills to maintain relevance and effectively lead technology initiatives.	16	94.12%	
36.Agile decision-making: In a high-tech environment, market conditions and customer needs can rapidly change. The adaptability of the chief technology officer enables them to make quick and wise decisions and quickly respond to emerging opportunities and challenges.	16	94.12%	
37.Embrace subversion: The high-tech industry is easily influenced by disruptive technologies that may reshape the market. The flexibility of the chief technology officer enables them to accept interruptions and identify opportunities to utilize these technologies for the benefit of the organization.	17	100%	
38.Navigation uncertainty (overcoming uncertainty): Uncertainty is widely present in the high-tech field,	17	100%	

Adaptability and resilience in high-tech environments	Freq	Pct	Sugg
such as changes in regulations, geopolitical factors, technology officers, and economic fluctuations. The flexibility of the chief technology officer enables them to overcome uncertainty while maintaining a focus on the organization's long-term vision.			
39.Rotation strategy: The adaptability of the chief technology officer enables them to shift to technology strategies when necessary. They can shift their focus based on market trends and customer needs, ensuring that technical solutions align with business goals.	16	94.12%	
40.Experimentation and Innovation: Flexibility encourages chief technology officer to cultivate a culture of experimentation and innovation within the organization. By accepting calculated risks, the chief technology officer can drive technology driven initiatives, thereby creating a competitive advantage.	17	100%	
41.Resolve failed issues: In the high-tech field, not all initiatives can be successful. The flexibility of the chief technology officer enables them to view failure as a learning opportunity and adjust strategies to improve future outcomes.	17	100%	
42.Technical Implementation Challenges: Implementing new technologies may bring unforeseen challenges. The adaptability of the Chief Technical Officer enables them to adjust implementation plans and effectively overcome obstacles.	16	94.12%	
43.Talent retention and development: The high-tech field is highly competitive for top technical talents. The flexibility of the chief technology officer enables them to develop strategies to retain and cultivate the best talents, ensuring the organization's ability to innovate and grow.	17	100%	

Adaptability and resilience in high-tech environments	Freq	Pct	Sugg
44.Dealing with market fluctuations: The high-tech industry is susceptible to market fluctuations and disruptive trends. The flexibility of the chief technology officer enables them to withstand market fluctuations, positioning the organization for long-term success.	16	94.12%	
45.Leading through change: In a fast-paced high-tech environment, the resilience of the chief technology officer enables them to effectively lead change. They maintain a positive perspective, motivate the entire team, and unite the entire organization around common goals.	17	100%	
46.Continuous learning: Adaptability and resilience drive chief technology officer to engage in continuous learning and professional development. Continuously understanding the latest trends and best practices can improve chief technology officer's efficiency as a technology leader.	16	94.12%	
47.Ability to obtain information: The ability to acquire relevant knowledge in this field, especially cutting-edge knowledge related to the development direction of this field, through multiple channels	16	94.12%	
48.Inferential innovation ability: The ability to understand and reason about a thing by breaking it down into several parts or describing its internal connections through layers of causal relationships, thus innovating on the basis of that thing	16	94.12%	
49.Project risk identification and control capabilities: Able to identify risks in the project and take measures to control them	17	100%	

Cultivate innovation and research and development	Freq	Pct	Sugg
50.Research decision-making ability: Able to grasp the project from a macro perspective and determine its feasibility based on the information obtained	17	100%	
51.Experimental observation ability: Pay attention to the operation of the project and be able to keenly observe the fluctuations in project operation	16	94.12%	
52.Creating an Innovative Culture: Creating an innovative culture can cultivate creativity, drive continuous improvement, and drive the growth and success of an organization. As a chief technology officer, establishing an innovation culture within the technical team and the entire organization is a key responsibility.	16	94.12%	
53.Manage intellectual property and patent capabilities: By effectively managing intellectual property and patents, the chief technology officer ensures that the organization's technological innovation is protected, leverages competitive advantages, and contributes to its long-term success in the high-tech field.	17	100%	
54.Integrating research and development with business objectives: For the chief technology officer (chief technology officer), it is crucial to align research and development (R&D) with business goals to ensure that technology plans align with organizational strategic goals and contribute to their long-term success. By effectively combining research and development with business objectives, chief technology officer can drive innovation, optimize resource allocation, and maximize the value of technology investment.	17	100%	

Addressing regulatory and compliance challenges	Freq	Pct	Sugg
55.Ensure safety and compliance: Having a deep understanding of network security and data protection, ensuring that the organization's technical systems and data are secure and comply with relevant regulations.	17	100%	
56.Addressing data privacy and security issues: In the era of widespread digital leaks and cyber threats, addressing data privacy and security issues is crucial for chief technology officers (chief technology officers). As the custodian of technology infrastructure and data management, chief technology officer plays a crucial role in ensuring that the organization's data remains protected and complies with privacy regulations.	17	100%	
57.Comply with industry standards and regulations: Compliance with industry standards and regulations is a key responsibility of the chief technology officer (cto) to ensure that organizations comply with legal requirements, industry best practices, and ethical guidelines. Failure to comply with these standards may result in legal liability, reputation damage, and operational interruption.	15	88.24%	

Environmental Sustainability Initiative	Freq	Pct	Sugg
58.energy efficiency: Promote the adoption of energy-saving technologies and practices within the organization. This includes optimizing the data center, using energy-efficient hardware, and implementing power management strategies for devices.	15	88.24%	
59.renewable energy: Explore opportunities for transitioning to renewable energy, such as solar, wind, or hydroelectric power, to power the organization's operations and reduce carbon emissions.	15	88.24%	
60.Green IT procurement: Prioritize the procurement	17	100%	

Environmental Sustainability Initiative	Freq	Pct	Sugg
of environmentally friendly IT equipment to ensure that hardware and components comply with recognized environmental standards, such as Energy Star certification.			
61.Circular Economy Practice: Extend the service life of IT equipment through maintenance, refurbishment, and recycling, embracing the principles of circular economy. Promote responsible electronic waste management and collaborate with certified recycling suppliers.	15	88.24%	
62.Virtualization and Cloud Computing: Encourage the adoption of virtualization and cloud computing to optimize resource utilization and reduce the physical footprint of IT infrastructure.	15	88.24%	
63.Carbon footprint tracking: Implement a system to track and measure the organization's carbon footprint. Regularly evaluate and report on carbon emissions to identify areas for improvement.	17	100%	
64.Sustainable software development: Encourage sustainable practices in software development, such as optimizing code to reduce energy consumption and minimize digital waste.	17	94.12%	
65.Remote work and remote work: Promote the choice of remote work and remote work to reduce carbon emissions related to commuting and promote healthier work life balance for employees.	17	100%	
66.Paperless Initiative: Promote paperless practices within organizations by encouraging digital documents, electronic signatures, and electronic communication.	16	94.12%	
67.Employee Education and Participation: Educate employees on environmental sustainability and encourage them to actively participate in green initiatives. Carry out promotional activities and involve	16	94.12%	

Environmental Sustainability Initiative	Freq	Pct	Sugg
employees in sustainable development projects.			
68.Supplier Sustainable Development: Collaborate with suppliers and partners to ensure that sustainable development practices are integrated into the supply chain. Prioritize suppliers with strong environmental commitments.	16	94.12%	
69.Green Data Center: Optimize data center operations to reduce energy consumption and waste. Consider energy-saving cooling solutions and utilize advanced power management tools.	16	94.12%	
70.Green Building and Facility Management: If applicable, implement green building practices and sustainable facility management to reduce the overall environmental impact of the organization.	17	100%	
71.Environmental certification: Strive to obtain recognized environmental certifications, such as LEED (Leadership in Energy and Environmental Design) or ISO 14001, to demonstrate the organization's commitment to sustainable development.	16	94.12%	

Social Responsibility and Moral Practice	Freq	Pct	Sugg
72.Corporate Social Responsibility (CSR) Strategy: Collaborate with company leaders to develop a comprehensive corporate social responsibility strategy that aligns with organizational values and mission. Incorporate social and ethical considerations into technological decision-making.	17	100%	
73.Ethical Technology Use: Ensure that technical solutions and applications adhere to ethical standards and respect user privacy and data security. Implement strict data protection measures to protect customer information.	17	100%	

Social Responsibility and Moral Practice	Freq	Pct	Sugg
74.Inclusive design: Advocate inclusive design practices to cater to different user groups and consider accessibility needs. Ensure that all individuals have access to and use technology products and services.	17	100%	
75.Environmental sustainability: Promote environmental sustainability initiatives and implement environmental practices in technology operations. This includes adopting energy-saving technologies, reducing electronic waste, and promoting sustainable IT practices.	16	94.12%	
76.diversity and inclusion: Winning championships, diversity, and inclusivity within the technical team and the entire organization. Encourage different recruitment practices and create an inclusive work environment that values different perspectives.	17	100%	
77.Ethical supply chain: Collaborate with suppliers and suppliers to ensure ethical practices throughout the entire supply chain. Prioritize cooperation with suppliers who adhere to fair labor practices and sustainable procurement.	16	94.12%	
78.Responsible innovation: Cultivate a responsible innovation culture where technological initiatives consider potential social and ethical impacts. Predict and address any unexpected consequences of technical solutions.	17	100%	
79.transparency and accountability: Practice transparency in technical operations and decision-making. Responsible for addressing the impact of technological initiatives on society, customers, and stakeholders.	17	100%	
80.Ethical artificial intelligence and data ethics: Promote the ethical use of artificial intelligence (AI)	17	100%	

Social Responsibility and Moral Practice	Freq	Pct	Sugg
and data ethics. Develop responsible guidelines for artificial intelligence deployment and data processing, taking into account potential biases and privacy issues.			
81.Community participation: Participate in local communities and participate in social initiatives to address community needs. Encourage technical teams to become volunteers and contribute their skills to social undertakings.	16	94.12%	
82.Ethical standards and code of conduct: Develop and implement ethical standards and codes of conduct for the technical team. Ensure employees are aware of ethical expectations and follow best practices.	17	100%	
83.Human rights and labor practices: Ensure that the organization's technical operations uphold human rights and fair labor practices. Avoid engaging in projects that lead to human rights violations or unethical labor practices.	17	100%	
84.Stakeholder engagement: Engage with stakeholders, including customers, employees, investors, and the community, understand their concerns, and incorporate their feedback into technical strategies.	17	100%	

Economic sustainability and long-term feasibility	Freq	Pct	Sugg
85.Business Model Assessment: Collaborate with business leaders to evaluate the organization's current business model and identify opportunities for improvement. Ensure consistency between technology plans and the organization's revenue generation and cost optimization strategies.	17	100%	

Economic sustainability and long-term feasibility	Freq	Pct	Sugg
86.Financial planning and budgeting: Work closely with the finance team to create realistic financial plans and budgets, and strategically allocate resources in technical projects. Prioritize plans with clear paths to generate value and return on investment (ROI).	17	100%	
87.Profitability and cost control: Focus on improving profitability and optimizing operating costs. Assess technology related costs and explore opportunities for cost savings through automation, process improvement, and resource optimization.	16	94.12%	
88.Market analysis and trends: Stay up-to-date with market trends, customer preferences, and emerging technologies. Utilize market insights to guide technical decisions and ensure that the organization remains competitive and relevant.	16	94.12%	
89.Diversification of income streams: Encourage the use of organizational technological capabilities to explore new revenue streams and business opportunities. Diversification reduces dependence on a single source of income and enhances financial stability.	16	94.12%	
90.risk management: Identify potential economic risks, such as market fluctuations, regulatory changes, or supply chain disruptions, and develop risk management strategies to mitigate their impact on the organization.	17	100%	
91.Long term innovation investment: Balancing short-term technological initiatives with long-term investment in innovation. Cultivate a culture of continuous improvement, research and development (R&D) to drive sustainable growth.	17	100%	
92.Agility and adaptability: Promote agility and	16	94.12%	

Economic sustainability and long-term feasibility	Freq	Pct	Sugg
adaptability within the technical team to quickly respond to constantly changing market conditions and customer needs. Adopting agile methods to ensure that technical plans remain relevant and flexible.			
93.Strategic partnership: Explore strategic partnerships and collaborations with other organizations to leverage complementary technologies and expand market reach.	16	94.12%	
94.Talent management and retention: Invest in talent management programs to attract and retain top technical professionals. A skilled and proactive workforce helps drive innovation and maintain long-term viability.	17	100%	
95.Environmental and Social Responsibility: Embrace sustainable development initiatives and corporate social responsibility practices. Demonstrating commitment to environmental and social issues can enhance an organization's reputation and appeal to stakeholders.	17	100%	
96.Continuous monitoring and evaluation: Regularly monitor and evaluate the performance of technical plans based on economic goals. Use data-driven insights to make informed decisions and adjust strategies as needed.	16	94.12%	

Key steps to fully utilize emerging technologies	Freq	Pct	Sugg
97.Technical Landscape Analysis: Conduct a comprehensive analysis of the current technological landscape, including market trends, emerging technologies, and potential disruptions. Please stay updated on the progress in various technical fields.	16	94.12%	
98.Strategic coordination: Coordinate technology	17	100%	

Key steps to fully utilize emerging technologies	Freq	Pct	Sugg
plans with the organization's long-term strategic goals. Identify areas where emerging technologies can support business goals and create competitive advantages			
99.Innovative mindset: Cultivate an innovative mindset within the technical team. Encourage creative thinking, experimentation, and willingness to explore new ideas and technologies.	16	94.12%	
100.pilot project: Implement pilot projects to test and evaluate the feasibility and potential impact of emerging technologies. Use a concept validation plan to evaluate feasibility and scalability.	15	88.24%	
101.Collaboration and Partnership: Collaborate with external partners such as startups, research institutions, and technology suppliers to gain a deeper understanding of cutting-edge technologies and explore collaboration opportunities.	17	100%	
102.Data-driven decision-making: Technical decisions based on data-driven insights and performance metrics. Utilize analysis and market research to support the adoption of emerging technologies.	17	100%	
103.Talent acquisition and development: Invest in talent acquisition and development, and establish a skilled workforce that can effectively utilize emerging technologies.	17	100%	
104.Risk and Security Management: Assess the risks associated with adopting emerging technologies and develop risk management strategies. Prioritize data security and privacy considerations.	17	100%	
105.Scalability and flexibility: Evaluate the scalability and flexibility of emerging technologies to ensure they can meet future organizational needs and adapt to constantly changing market demands.	16	94.12%	

Key steps to fully utilize emerging technologies	Freq	Pct	Sugg
106.Regulatory compliance: Continuously updating regulations and compliance requirements related to emerging technologies. Ensure that the organization complies with relevant laws and industry standards.	16	94.12%	
107.Technical roadmap: Develop a technology roadmap outlining the integration and deployment of emerging technologies. The plan is implemented in stages to minimize interruptions.	17	100%	
108.User centric approach: When implementing emerging technologies, a user centric approach should be adopted. Focusing on creating value for customers and enhancing user experience.	16	94.12%	
109.Continuous evaluation and improvement: Continuously evaluate the impact of the adopted technology on organizational goals. Be prepared to adjust strategies based on feedback and performance results.	16	94.12%	

Key steps to fully utilize data analysis and decision-making	Freq	Pct	Sugg
110.Visualization and Communication: Utilize data visualization tools to provide insights to stakeholders in a clear and actionable format. Communicate the research results of the data analysis plan to key decision-makers to influence strategic choices.	16	94.12%	
111.Predictive analysis for prediction: Use predictive analysis to predict future trends, market demand, and customer behavior. Use predictive models to identify potential risks and opportunities, enabling organizations to proactively respond to challenges.	17	100%	
112.Real time analysis of agility: Implement real-time analysis function to achieve agile decision-making. Real	17	100%	

Key steps to fully utilize data analysis and decision-making	Freq	Pct	Sugg
time insight allows organizations to quickly respond to constantly changing situations.			
113.Ethical considerations: Ensure that the data analysis process complies with ethical standards, especially in terms of data privacy and protection. Responsible and transparent use of data to build trust with customers and stakeholders.	15	88.24%	
114.Continuous improvement: Embrace a culture of continuous improvement in data analysis practices. Regularly review and optimize the data analysis process to improve its effectiveness.	17	100%	
115.effective communication: Clearly and transparently communicate the fundamental principles behind change, explain how it aligns with the organization's goals, and benefit all stakeholders. Open resolution of concerns and issues, regularly providing updates on changes and progress.	17	100%	
116.Early engagement with stakeholders: Engage key stakeholders from the beginning of the change process, including employees, managers, and department heads. Seek their opinions, listen to their feedback, and incorporate their ideas into the change plan.	16	94.12%	
117.Create a shared vision: Develop a shared vision for change, resonate with employees, and motivate them to support the initiative. Emphasize the positive impact of change on individuals and organizations.	17	100%	
118.Authorize change agents: Identify change advocates within the organization who can advocate for change and actively influence others. Authorize change agents to lead by example and share success stories.	16	94.12%	

Strategies to overcome the resistance of sustainable reform in enterprises	Freq	Pct	Sugg
119. Provide training and support: Provide training and development projects to help employees develop the skills needed to successfully adapt to change. Provide continuous support and resources to ensure employees feel confident in implementing change.	17	100%	
120. Addressing Fear and Uncertainty: Acknowledging that change may be unsettling and openly and generously addressing employees' fears and concerns. Provide assurance and support throughout the entire transition process.	16	94.12%	
121. Celebrate Rapid Victory: Identify and celebrate rapid victories to showcase positive results of early changes in the process. Recognize and reward individuals and teams for their contributions to the successful implementation of change.	17	100%	
122. Break down changes into manageable steps: Divide changes into smaller and manageable steps, making it easier for employees to gradually adapt. Celebrate every step of progress to build motivation and motivate employees.	17	100%	
123. Lead by example: As a chief technology officer, as a role model, embrace change and demonstrate a willingness to learn and adapt. Show commitment to change initiatives to motivate others to follow suit.	17	100%	
124. Monitoring and adjustment: Continuously monitor the progress of changes and prepare to adjust methods as needed. Maintain flexibility and responsiveness to feedback and constantly changing environments.	17	100%	

Strategies for managing stakeholder expectations	Freq	Pct	Sugg
125.Open and transparent communication: Cultivate an open and transparent communication culture with stakeholders. Regularly provide progress on technical projects, including successes, challenges, and any changes in time or scope.	17	100%	
126.Actively listening: Actively listen to the concerns, feedback, and expectations of stakeholders. Show empathy and understanding, and quickly resolve any issues raised.	16	94.12%	
127.Set realistic expectations: Timeline, costs, and potential outcomes of real-world technology plans. Avoid excessive commitment and insufficient delivery, as this may erode the trust of stakeholders.	16	94.12%	
128.Establish clear goals and objectives: Clearly define the goals and objectives of technical projects based on the overall strategy of the organization. Ensure that stakeholders have a clear understanding of the project's purpose and expected outcomes.	17	100%	
129.Engage stakeholders as early as possible: Engage stakeholders in the early stages of technology projects to gather their opinions and insights. Engaging stakeholders in the decision-making process can enhance their ownership and support.	17	100%	
130.Provide demonstrations and progress reports: Provide technical solutions or prototype demonstrations to stakeholders to visualize potential benefits. Provide progress reports with measurable results to demonstrate the value of the project.	17	100%	
131.Manage risks and issues: Proactively identify and manage risks and issues related to technical projects. Communicate mitigation plans to stakeholders to instill confidence in project management.	17	100%	

Strategies for managing stakeholder expectations	Freq	Pct	Sugg
132. Building trust and credibility: Demonstrate ability and expertise in technical issues to build trust and credibility with stakeholders. Respond reliably to their concerns.	16	94.12%	
133. Resolve conflicts and differences of opinion: Predict conflicts and disagreements among stakeholders and constructively address these issues. Seek common ground and compromise to find the most suitable solution for the organization's interests.	16	94.12%	
134. Continuous engagement: Maintain continuous engagement with stakeholders throughout the entire project lifecycle. Seek their opinions at key decision points and ensure that their expectations are taken into account.	17	100%	
135. Celebrate achievements: Celebrate project milestones and successes with stakeholders to strengthen their support and enthusiasm for future plans.	17	100%	

Prediction of the Future Role of chief technology officer	Freq	Pct	Sugg
136. Focus on digital transformation: chief technology officer will take the lead in carrying out digital transformation work, guiding organizations to adopt emerging technologies and digital processes to improve efficiency and customer experience.	17	100%	
137. Data-driven decision-making: chief technology officer will utilize data analysis and artificial intelligence to make informed, data-driven decisions to optimize business operations and drive growth. They will be responsible for identifying valuable insights from a large dataset to gain a competitive advantage.	17	100%	

Prediction of the Future Role of chief technology officer	Freq	Pct	Sugg
138. Leading position in cybersecurity: With the increasing prevalence of cyber threats, chief technology officer will play a crucial role in ensuring the soundness and up-to-date nature of the organization's cybersecurity measures. They will prioritize network security risk management to protect sensitive data and intellectual property.	17	100%	
139. Sustainability and ethical technology adoption: chief technology officer will actively support sustainable and ethical technology practices, taking into account the environmental and social impacts of technology adoption. They will strive to achieve responsible artificial intelligence and data usage.	17	100%	
140. Customer centric innovation: chief technology officer will promote customer-centric innovation by focusing on user experience and ensuring that technological solutions meet customer needs. They will be at the forefront of developing personalized and seamless digital experiences.	16	94.12%	
141. Agility and flexibility: chief technology officer will adopt agile methods and promote an adaptive culture to quickly respond to market changes and constantly changing customer needs.	16	94.12%	
142. Collaboration with senior executives: chief technology officer will work closely with other executives, including the CEO, CFO, and CMO, to align technology strategy with broader business goals.	16	94.12%	
143. Talent management and skill enhancement skills: chief technology officer will play an important role in attracting and retaining top technical talents, ensuring that employees have the opportunity to improve their skills and continue learning.	17	100%	

Prediction of the Future Role of chief technology officer	Freq	Pct	Sugg
144.Emphasize the innovation ecosystem: chief technology officer will explore partnerships, collaboration, and open innovation to create dynamic ecosystems, promote innovation, and acquire cutting-edge technologies.	17	100%	
145.Addressing Regulatory Challenges: chief technology officer will address complex regulatory environments and ensure compliance with data protection and privacy regulations.	16	94.12%	

 Round 2

 The qualities and abilities that chief technology officers in high-tech enterprises should possess

Mdn Mo IQR

Technical expertise and vision

1. Technical expertise: The technical expertise of chief technology officer is the foundation of their role. It involves in-depth knowledge and understanding of various technologies, systems, and tools related to the industry and operations of the organization. This expertise enables chief technology officer to make informed decisions, design powerful technical solutions, and provide strategic guidance to other teams.

5 5 1

2. Evaluate emerging technologies: Technical expertise enables the chief technology officer to evaluate emerging technologies and assess their potential impact on the organization. They can identify trends, identify disruptive technologies, and recommend strategic investments to maintain a leading position in the competition

5 5 1

3. Harnessing complex technological environments: In a rapidly evolving technological environment, the expertise of the chief technology officer enables them to navigate complex environments and make informed decisions. They ensure that the organization adopts the correct technology and continuously updates industry best practices.

4 5 1

4. Building Scalable Solutions: chief technology officer's technical expertise enables them to design scalable and future-oriented solutions to adapt to the growth and constantly changing needs of the organization. They ensure that the technological infrastructure and systems can handle the growing demand.

2 3 1

The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mo	IQR
5.Addressing technical challenges:When faced with technical challenges, the expertise of the Chief Technical Officer comes into play to find effective solutions. They can solve problems, implement repair programs, and minimize disruptions to business operations.	5	5	1
6.Promoting innovation:The technical expertise of the chief technology officer cultivates a culture of innovation within the organization. They inspire technical teams to explore new ideas and attempt to use cutting-edge technology to drive business innovation.	5	5	1
Business acumen and strategic thinking			
7.Driving Technology Strategy:With their professional knowledge, chief technology officers can create and implement comprehensive technical strategies that are aligned with the overall goals of the organization. They have identified opportunities to leverage technology to gain competitive advantage, optimize processes, and drive growth	4	5	1
8.Understand business objectives:Business acumen can help chief technology officers understand the organization's goals and objectives. With these understandings, they can adjust their technological strategies and initiatives to support and strengthen the achievement of these goals.	4	5	1

The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mo	IQR
<p>9.decision-making:Strategic thinking enables the chief technology officer to make wise and thoughtful decisions on technology investment, resource allocation, and project priorities. They can weigh the broader impact on the organization and consider potential risks and benefits.</p>	3	3	1
<p>10.financial management:Business acumen enables the chief technology officer to effectively manage technology budgets. They can effectively allocate resources, optimize technology expenditures, and demonstrate the return on investment of technology plans.</p>	4	4	1.5
<p>11.Market awareness:Strategic thinking includes maintaining an understanding of market trends, customer needs, and industry disruptions. The chief technology officer can use this knowledge to identify technology driven innovation opportunities that align with market demand.</p>	5	5	1
<p>12.Value creation:Business intelligence allows chief technology officer to focus on creating value for the organization. They can determine how technology can improve products, services, and processes to drive revenue growth and customer satisfaction.</p>	5	5	1
<p>13.Reduce risk:Strategic thinking includes predicting potential risks and challenges. The chief technology officer can develop contingency plans to mitigate risks related to technology implementation, cybersecurity, and data privacy.</p>	3	3	1

The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mo	IQR
14. Innovation consistency: Business intelligence ensures that technology driven innovation is aligned with the overall business strategy of the organization. The chief technology officer can prioritize innovative efforts to provide competitive advantage and drive growth.	5	5	1
15. Cross functional collaboration: Strategic thinking promotes collaboration with other executives and department heads. The chief technology officer can collaborate with different stakeholders to align technology plans with broader business objectives.	4	4	1
16. Opportunity assessment: Business intelligence enables the chief technology officer to evaluate new opportunities for adoption. They can identify areas where technology can optimize processes, reduce costs, and improve overall efficiency.	4	5	1.5
17. Long term planning: Strategic thinking includes long-term planning and envisioning the future of the organization. The chief technology officer can develop a technology roadmap that is consistent with the organization's long-term vision and support its development trajectory.	5	5	1
18. Performance evaluation: Business acumen allows chief technology officer to evaluate the effectiveness of technical plans. They can use key performance indicators (KPIs) to measure results and adjust strategies accordingly.	4	5	1

The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mo	IQR
<p>19.A customer-centric approach:Strategic thinking helps chief technology officer adopt a customer-centric approach to technology development. They can prioritize technical solutions that meet customer needs and enhance the overall customer experience.</p>	4	5	1
<p>20.competitive edge:Business acumen allows the chief technology officer to identify opportunities to gain competitive advantage through technological differentiation and innovation.</p>	4	4	1
Collaboration and team building			
<p>21.Cross functional collaboration (chief technology officer works closely with other executives):Collaboration allows chief technology officers to work closely with other executives, such as the CEO, CFO, COO, and CMO, to align technology strategies with broader business goals. By collaborating with different departments, chief technology officer ensures that technical solutions support the organization.</p>	5	5	1
<p>22.Collaboration with technical team:Technical expertise allows chief technology officer to have meaningful discussions with the technical team. They can provide guidance, guidance, and support to promote a collaborative and productive work environment.</p>	5	5	1

The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mo	IQR
<p>23. Effective communication: Collaboration requires effective communication skills. The chief technology officer must communicate technical concepts and strategies in a clear and concise manner to stakeholders at all levels of the organization, including non-technical personnel.</p>	5	5	1
<p>24. Establish a high-performance team: Team building is crucial for forming and cultivating high-performance technical teams. The Chief Technical Officer is responsible for identifying and recruiting top talent, cultivating a positive work culture, and encouraging teamwork and camaraderie among team members.</p>	5	5	1
<p>25. Encourage team innovation: Collaboration creates an environment where team members are willing to share ideas and contribute to innovation. The chief technology officer encourages and values the opinions of team members, leading to breakthroughs and creative solutions.</p>	5	5	1
<p>26. Authorize team members: The Chief Technical Officer authorizes team members to assume their own roles and responsibilities. By providing autonomy and trust, chief technology officer cultivates a sense of ownership and responsibility among team members.</p>	5	5	1
<p>27. Guidance and professional development: Collaboration and team building enable the Chief Technical Officer to guide and support the professional development of team members. This includes providing training opportunities, career development guidance, and guidance.</p>	5	5	1

The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mo	IQR
28.Conflict team resolution:In a collaborative work environment, conflicts may arise. The Chief Technical Officer must be proficient in conflict resolution and mediation to ensure that issues are quickly and constructively resolved.	4	5	1
29.Ensure team diversity and inclusivity:Collaboration and team building promote diversity and inclusiveness within the technical team. The chief technology officer ensures that different perspectives are valued and maintains an inclusive work environment.	4	4	1
30.Adaptive leadership:Collaboration requires employees to possess adaptive leadership skills. The Chief Technical Officer must provide flexible and open feedback, adjusting their leadership style to meet the needs and preferences of different team members.	4	5	1
31.Encourage open communication within the team:Team building involves creating an atmosphere of open communication and trust. The chief technology officer has developed an environment where team members are willing to express their opinions and concerns.	4	5	1
32.Commending achievements:The Chief Technical Officer recognizes and celebrates the achievements of individual team members and the entire team. Recognizing one's achievements can boost morale and motivate team members to stand out.	5	5	1.5

The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mo	IQR
33.Promoting knowledge sharing:Collaboration and team building encourage knowledge sharing among team members. The Chief Technical Officer provides team members with the opportunity to share professional knowledge, best practices, and lessons learned.	4	5	1
34.Shared goals and vision:Collaboration ensures that all team members are aligned with the organization's goals and technical vision. The chief technology officer ensures that the team's efforts are synchronized with broader goals.	2	2	1
Adaptability and resilience in high-tech environments			
35.Dynamic technology landscape (closely following technology hotspots):The high-tech industry has experienced frequent technological progress and innovation. The chief technology officer must adapt to these changes and constantly update their knowledge and skills to maintain relevance and effectively lead technology initiatives.	5	5	1
36.Agile decision-making:In a high-tech environment, market conditions and customer needs can rapidly change. The adaptability of the chief technology officer enables them to make quick and wise decisions and quickly respond to emerging opportunities and challenges.	5	5	1
37.Embrace subversion:The high-tech industry is easily influenced by disruptive technologies that may reshape the market. The flexibility of the chief technology officer enables them to accept interruptions and identify opportunities to utilize these technologies for the benefit of the organization.	4	4	1

The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mo	IQR
<p>38.Navigation uncertainty (overcoming uncertainty):Uncertainty is widely present in the high-tech field, such as changes in regulations, geopolitical factors, and economic fluctuations. The flexibility of the chief technology officer enables them to overcome uncertainty while maintaining a focus on the organization's long-term vision.</p>	4	5	1.5
<p>39.Rotation strategy:The adaptability of the chief technology officer enables them to shift to technology strategies when necessary. They can shift their focus based on market trends and customer needs, ensuring that technical solutions align with business goals.</p>	5	5	1
<p>40.Experimentation and Innovation:Flexibility encourages chief technology officer to cultivate a culture of experimentation and innovation within the organization. By accepting calculated risks, the chief technology officer can drive technology driven initiatives, thereby creating a competitive advantage.</p>	4	4	1
<p>41.Resolve failed issues:In the high-tech field, not all initiatives can be successful. The flexibility of the chief technology officer enables them to view failure as a learning opportunity and adjust strategies to improve future outcomes.</p>	5	5	1
<p>42.Technical Implementation Challenges:Implementing new technologies may bring unforeseen challenges. The adaptability of the Chief Technical Officer enables them to adjust implementation plans and effectively overcome obstacles.</p>	5	5	1

The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mo	IQR
43.Talent retention and development:The high-tech field is highly competitive for top technical talents. The flexibility of the chief technology officer enables them to develop strategies to retain and cultivate the best talents, ensuring the organization's ability to innovate and grow.	3	4	1
44.Dealing with market fluctuations:The high-tech industry is susceptible to market fluctuations and disruptive trends. The flexibility of the chief technology officer enables them to withstand market fluctuations, positioning the organization for long-term success.	4	5	1.5
45.Leading through change:In a fast-paced high-tech environment, the resilience of the chief technology officer enables them to effectively lead change. They maintain a positive perspective, motivate the entire team, and unite the entire organization around common goals.	4	4	1
46.Continuous learning:Adaptability and resilience drive chief technology officer to engage in continuous learning and professional development. Continuously understanding the latest trends and best practices can improve chief technology officer's efficiency as a technology leader.	5	5	1
Cultivate innovation and research and development			
47.Ability to obtain information:The ability to acquire relevant knowledge in this field, especially cutting-edge knowledge related to the development direction of this field, through multiple channels	5	5	1

The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mo	IQR
48. Inferential innovation ability: The ability to understand and reason about a thing by breaking it down into several parts or describing its internal connections through layers of causal relationships, thus innovating on the basis of that thing	5	5	1
49. Project risk identification and control capabilities: Able to identify risks in the project and take measures to control them	5	5	1
50. Research decision-making ability: Able to grasp the project from a macro perspective and determine its feasibility based on the information obtained	5	5	1.5
51. Experimental observation ability: Pay attention to the operation of the project and be able to keenly observe the fluctuations in project operation	4	4	1
52. Creating an Innovative Culture: Creating an innovative culture can cultivate creativity, drive continuous improvement, and drive the growth and success of an organization. As a chief technology officer, establishing an innovation culture within the technical team and the entire organization is a key responsibility.	5	5	1
53. Manage intellectual property and patent capabilities: By effectively managing intellectual property and patents, the chief technology officer ensures that the organization's technological innovation is protected, leverages competitive advantages, and contributes to its long-term success in the high-tech field.	5	5	1

The qualities and abilities that chief technology officers in high-tech enterprises should possess	Mdn	Mo	IQR
<p>54.Integrating research and development with business objectives:For the chief technology officer (chief technology officer), it is crucial to align research and development (R&D) with business goals to ensure that technology plans align with organizational strategic goals and contribute to their long-term success. By effectively combining research and development with business objectives, chief technology officer can drive innovation, optimize resource allocation, and maximize the value of technology investment.</p>	5	5	1
Addressing regulatory and compliance challenges			
<p>55.Ensure safety and compliance:Having a deep understanding of network security and data protection, ensuring that the organization's technical systems and data are secure and comply with relevant regulations.</p>	4	5	1
<p>56.Addressing data privacy and security issues:In the era of widespread digital leaks and cyber threats, addressing data privacy and security issues is crucial for chief technology officers (chief technology officers). As the custodian of technology infrastructure and data management, chief technology officer plays a crucial role in ensuring that the organization's data remains protected and complies with privacy regulations.</p>	4	4	1
<p>57.Comply with industry standards and regulations:Compliance with industry standards and regulations is a key responsibility of the chief technology officer (chief technology officer) to ensure that organizations comply with legal requirements, industry best practices, and ethical guidelines. Failure to comply with these standards may result in legal liability, reputation damage, and operational interruption.</p>	4	5	1

Sustainable development strategies that high-tech enterprises need to possess	Mdn	Mo	IQR
Environmental Sustainability Initiative			
58.energy efficiency: Promote the adoption of energy-saving technologies and practices within the organization. This includes optimizing the data center, using energy-efficient hardware, and implementing power management strategies for devices.	4	4	1.5
59.renewable energy: Explore opportunities for transitioning to renewable energy, such as solar, wind, or hydroelectric power, to power the organization's operations and reduce carbon emissions.	4	4	2
60.Green IT procurement: Prioritize the procurement of environmentally friendly IT equipment to ensure that hardware and components comply with recognized environmental standards, such as Energy Star certification.	4	4	2
61.Circular Economy Practice: Extend the service life of IT equipment through maintenance, refurbishment, and recycling, embracing the principles of circular economy. Promote responsible electronic waste management and collaborate with certified recycling suppliers.	4	3	2
62.Virtualization and Cloud Computing: Encourage the adoption of virtualization and cloud computing to optimize resource utilization and reduce the physical footprint of IT infrastructure.	4	4	1.5

Sustainable development strategies that high-tech enterprises need to possess	Mdn	Mo	IQR
63. Carbon footprint tracking: Implement a system to track and measure the organization's carbon footprint. Regularly evaluate and report on carbon emissions to identify areas for improvement.	4	3	2
64. Sustainable software development: Encourage sustainable practices in software development, such as optimizing code to reduce energy consumption and minimize digital waste.	4	4	1
65. Remote work and remote work: Promote the choice of remote work and remote work to reduce carbon emissions related to commuting and promote healthier work life balance for employees.	4	4	1
66. Paperless Initiative: Promote paperless practices within organizations by encouraging digital documents, electronic signatures, and electronic communication.	5	5	1
67. Employee Education and Participation: Educate employees on environmental sustainability and encourage them to actively participate in green initiatives. Carry out promotional activities and involve employees in sustainable development projects.	4	5	1.5
68. Supplier Sustainable Development: Collaborate with suppliers and partners to ensure that sustainable development practices are integrated into the supply chain. Prioritize suppliers with strong environmental commitments.	2	2	1

Sustainable development strategies that high-tech enterprises need to possess	Mdn	Mo	IQR
69.Green Data Center: Optimize data center operations to reduce energy consumption and waste. Consider energy-saving cooling solutions and utilize advanced power management tools.	4	4	2
70.Green Building and Facility Management: If applicable, implement green building practices and sustainable facility management to reduce the overall environmental impact of the organization.	4	3	2
71.Environmental certification: Strive to obtain recognized environmental certifications, such as LEED (Leadership in Energy and Environmental Design) or ISO 14001, to demonstrate the organization's commitment to sustainable development.	4	4	2
Social Responsibility and Moral Practice			
72.Corporate Social Responsibility (CSR) Strategy: Collaborate with company leaders to develop a comprehensive corporate social responsibility strategy that aligns with organizational values and mission. Incorporate social and ethical considerations into technological decision-making.	4	4	1
73.Ethical Technology Use: Ensure that technical solutions and applications adhere to ethical standards and respect user privacy and data security. Implement strict data protection measures to protect customer information.	4	5	1
74.Inclusive design: Advocate inclusive design practices to cater to different user groups and consider accessibility needs. Ensure that all individuals have access to and use technology products and services.	4	4	1

Sustainable development strategies that high-tech enterprises need to possess	Mdn	Mo	IQR
75.Environmental sustainability: Promote environmental sustainability initiatives and implement environmental practices in technology operations. This includes adopting energy-saving technologies, reducing electronic waste, and promoting sustainable IT practices.	4	5	1
76.diversity and inclusion: Winning championships, diversity, and inclusivity within the technical team and the entire organization. Encourage different recruitment practices and create an inclusive work environment that values different perspectives.	4	4	1
77.Ethical supply chain: Collaborate with suppliers and suppliers to ensure ethical practices throughout the entire supply chain. Prioritize cooperation with suppliers who adhere to fair labor practices and sustainable procurement.	5	5	1
78.Responsible innovation: Cultivate a responsible innovation culture where technological initiatives consider potential social and ethical impacts. Predict and address any unexpected consequences of technical solutions.	5	5	1
79.transparency and accountability: Practice transparency in technical operations and decision-making. Responsible for addressing the impact of technological initiatives on society, customers, and stakeholders.	4	4	1
80.Ethical artificial intelligence and data ethics: Promote the ethical use of artificial intelligence (AI) and data ethics. Develop responsible guidelines for artificial intelligence deployment and data processing, taking into account potential biases and privacy issues.	4	4	1

Sustainable development strategies that high-tech enterprises need to possess	Mdn	Mo	IQR
81.Community participation: Participate in local communities and participate in social initiatives to address community needs. Encourage technical teams to become volunteers and contribute their skills to social undertakings.	2	2	1
82.Ethical standards and code of conduct: Develop and implement ethical standards and codes of conduct for the technical team. Ensure employees are aware of ethical expectations and follow best practices.	4	5	1
83.Human rights and labor practices: Ensure that the organization's technical operations uphold human rights and fair labor practices. Avoid engaging in projects that lead to human rights violations or unethical labor practices.	4	3	2
84.Stakeholder engagement: Engage with stakeholders, including customers, employees, investors, and the community, understand their concerns, and incorporate their feedback into technical strategies.	4	4	1
Economic sustainability and long-term feasibility			
85.Business Model Assessment: Collaborate with business leaders to evaluate the organization's current business model and identify opportunities for improvement. Ensure consistency between technology plans and the organization's revenue generation and cost optimization strategies.	4	4	1
86.Financial planning and budgeting: Work closely with the finance team to create realistic financial plans and budgets, and strategically allocate resources in technical projects. Prioritize plans with clear paths to generate value and return on investment (ROI).	4	5	1

Sustainable development strategies that high-tech enterprises need to possess	Mdn	Mo	IQR
87.Profitability and cost control: Focus on improving profitability and optimizing operating costs. Assess technology related costs and explore opportunities for cost savings through automation, process improvement, and resource optimization.	5	5	1
88.Market analysis and trends: Stay up-to-date with market trends, customer preferences, and emerging technologies. Utilize market insights to guide technical decisions and ensure that the organization remains competitive and relevant.	4	5	1
89.Diversification of income streams: Encourage the use of organizational technological capabilities to explore new revenue streams and business opportunities. Diversification reduces dependence on a single source of income and enhances financial stability.	4	5	1.5
90.risk management: Identify potential economic risks, such as market fluctuations, regulatory changes, or supply chain disruptions, and develop risk management strategies to mitigate their impact on the organization.	4	5	1
91.Long term innovation investment: Balancing short-term technological initiatives with long-term investment in innovation. Cultivate a culture of continuous improvement, research and development (R&D) to drive sustainable growth.	4	5	1.5

Sustainable development strategies that high-tech enterprises need to possess	Mdn	Mo	IQR
92. Agility and adaptability: Promote agility and adaptability within the technical team to quickly respond to constantly changing market conditions and customer needs. Adopting agile methods to ensure that technical plans remain relevant and flexible.	4	4	1
93. Strategic partnership: Explore strategic partnerships and collaborations with other organizations to leverage complementary technologies and expand market reach.	4	5	1
94. Talent management and retention: Invest in talent management programs to attract and retain top technical professionals. A skilled and proactive workforce helps drive innovation and maintain long-term viability.	5	5	1
95. Environmental and Social Responsibility: Embrace sustainable development initiatives and corporate social responsibility practices. Demonstrating commitment to environmental and social issues can enhance an organization's reputation and appeal to stakeholders.	4	4	1
96. Continuous monitoring and evaluation: Regularly monitor and evaluate the performance of technical plans based on economic goals. Use data-driven insights to make informed decisions and adjust strategies as needed.	4	4	1

chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises	Mdn	Mo	IQR
97.Technical Landscape Analysis: Conduct a comprehensive analysis of the current technological landscape, including market trends, emerging technologies, and potential disruptions. Please stay updated on the progress in various technical fields.	5	5	1
98.Strategic coordination: Coordinate technology plans with the organization's long-term strategic goals. Identify areas where emerging technologies can support business goals and create competitive advantages	3	3	1
99.Innovative mindset: Cultivate an innovative mindset within the technical team. Encourage creative thinking, experimentation, and willingness to explore new ideas and technologies.	5	5	1
100.pilot project: Implement pilot projects to test and evaluate the feasibility and potential impact of emerging technologies. Use a concept validation plan to evaluate feasibility and scalability.	4	5	1
101.Collaboration and Partnership: Collaborate with external partners such as startups, research institutions, and technology suppliers to gain a deeper understanding of cutting-edge technologies and explore collaboration opportunities.	4	4	2
102.Data-driven decision-making: Technical decisions based on data-driven insights and performance metrics. Utilize analysis and market research to support the adoption of emerging technologies.	4	4	1

chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises	Mdn	Mo	IQR
103.Talent acquisition and development: Invest in talent acquisition and development, and establish a skilled workforce that can effectively utilize emerging technologies.	5	5	1
104.Risk and Security Management: Assess the risks associated with adopting emerging technologies and develop risk management strategies. Prioritize data security and privacy considerations.	4	4	1
105.Scalability and flexibility: Evaluate the scalability and flexibility of emerging technologies to ensure they can meet future organizational needs and adapt to constantly changing market demands.	4	4	1
106.Regulatory compliance: Continuously updating regulations and compliance requirements related to emerging technologies. Ensure that the organization complies with relevant laws and industry standards.	4	4	1
107.Technical roadmap: Develop a technology roadmap outlining the integration and deployment of emerging technologies. The plan is implemented in stages to minimize interruptions.	5	5	1
108.User centric approach: When implementing emerging technologies, a user centric approach should be adopted. Focusing on creating value for customers and enhancing user experience.	5	5	1
109.Continuous evaluation and improvement: Continuously evaluate the impact of the adopted technology on organizational goals. Be prepared to adjust strategies based on feedback and performance results.	5	5	1
Key steps to fully utilize data analysis and decision-making			
110.Visualization and Communication: Utilize data visualization tools to provide insights to stakeholders in a clear and actionable format. Communicate the research results of the data analysis plan to key decision-makers to influence strategic choices.	4	5	2

chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises	Mdn	Mo	IQR
111.Predictive analysis for prediction: Use predictive analysis to predict future trends, market demand, and customer behavior. Use predictive models to identify potential risks and opportunities, enabling organizations to proactively respond to challenges.	4	5	1
112.Real time analysis of agility: Implement real-time analysis function to achieve agile decision-making. Real time insight allows organizations to quickly respond to constantly changing situations.	4	5	1
113.Ethical considerations: Ensure that the data analysis process complies with ethical standards, especially in terms of data privacy and protection. Responsible and transparent use of data to build trust with customers and stakeholders.	4	5	2
114.Continuous improvement: Embrace a culture of continuous improvement in data analysis practices. Regularly review and optimize the data analysis process to improve its effectiveness.	4	4	1
115.effective communication: Clearly and transparently communicate the fundamental principles behind change, explain how it aligns with the organization's goals, and benefit all stakeholders. Open resolution of concerns and issues, regularly providing updates on changes and progress.	4	5	1
116.Early engagement with stakeholders: Engage key stakeholders from the beginning of the change process, including employees, managers, and department heads. Seek their opinions, listen to their feedback, and incorporate their ideas into the change plan.	4	4	1

chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises	Mdn	Mo	IQR
117.Create a shared vision: Develop a shared vision for change, resonate with employees, and motivate them to support the initiative. Emphasize the positive impact of change on individuals and organizations.	4	4	1
118.Authorize change agents: Identify change advocates within the organization who can advocate for change and actively influence others. Authorize change agents to lead by example and share success stories.	4	4	1.5
119.Provide training and support: Provide training and development projects to help employees develop the skills needed to successfully adapt to change. Provide continuous support and resources to ensure employees feel confident in implementing change.	5	5	1
120.Addressing Fear and Uncertainty: Acknowledging that change may be unsettling and openly and generously addressing employees' fears and concerns. Provide assurance and support throughout the entire transition process.	4	4	2
121.Celebrate Rapid Victory: Identify and celebrate rapid victories to showcase positive results of early changes in the process. Recognize and reward individuals and teams for their contributions to the successful implementation of change.	4	5	1.5
122.Break down changes into manageable steps: Divide changes into smaller and manageable steps, making it easier for employees to gradually adapt. Celebrate every step of progress to build motivation and motivate employees.	4	4	1
123.Lead by example: As a chief technology officer, as a role model, embrace change and demonstrate a willingness to learn and adapt. Show commitment to change initiatives to motivate others to follow suit.	5	5	1

chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises	Mdn	Mo	IQR
124. Monitoring and adjustment: Continuously monitor the progress of changes and prepare to adjust methods as needed. Maintain flexibility and responsiveness to feedback and constantly changing environments.	4	5	1
125. Open and transparent communication: Cultivate an open and transparent communication culture with stakeholders. Regularly provide progress on technical projects, including successes, challenges, and any changes in time or scope.	5	5	1
126. Actively listening: Actively listen to the concerns, feedback, and expectations of stakeholders. Show empathy and understanding, and quickly resolve any issues raised.	5	5	1
127. Set realistic expectations: Timeline, costs, and potential outcomes of real-world technology plans. Avoid excessive commitment and insufficient delivery, as this may erode the trust of stakeholders.	5	5	1
128. Establish clear goals and objectives: Clearly define the goals and objectives of technical projects based on the overall strategy of the organization. Ensure that stakeholders have a clear understanding of the project's purpose and expected outcomes.	4	4	1
129. Engage stakeholders as early as possible: Engage stakeholders in the early stages of technology projects to gather their opinions and insights. Engaging stakeholders in the decision-making process can enhance their ownership and support.	4	4	1

chief technology officer Strategies for Improving Sustainable Growth of High tech Enterprises	Mdn	Mo	IQR
130.Provide demonstrations and progress reports: Provide technical solutions or prototype demonstrations to stakeholders to visualize potential benefits. Provide progress reports with measurable results to demonstrate the value of the project.	4	4	1
131.Manage risks and issues: Proactively identify and manage risks and issues related to technical projects. Communicate mitigation plans to stakeholders to instill confidence in project management.	4	4	1
132.Building trust and credibility: Demonstrate ability and expertise in technical issues to build trust and credibility with stakeholders. Respond reliably to their concerns.	4	4	1
133.Resolve conflicts and differences of opinion: Predict conflicts and disagreements among stakeholders and constructively address these issues. Seek common ground and compromise to find the most suitable solution for the organization's interests.	4	4	1
134.Continuous engagement: Maintain continuous engagement with stakeholders throughout the entire project lifecycle. Seek their opinions at key decision points and ensure that their expectations are taken into account.	3	3	1
135.Celebrate achievements: Celebrate project milestones and successes with stakeholders to strengthen their support and enthusiasm for future plans.	4	5	1

Prediction of the Future Role of chief technology officer	Mdn	Mo	IQR
<p>136.Focus on digital transformation: chief technology officer will take the lead in carrying out digital transformation work, guiding organizations to adopt emerging technologies and digital processes to improve efficiency and customer experience.</p>	5	5	1.5
<p>137.Data-driven decision-making: chief technology officer will utilize data analysis and artificial intelligence to make informed, data-driven decisions to optimize business operations and drive growth. They will be responsible for identifying valuable insights from a large dataset to gain a competitive advantage.</p>	4	5	1
<p>138.Leading position in cybersecurity: With the increasing prevalence of cyber threats, chief technology officer will play a crucial role in ensuring the soundness and up-to-date nature of the organization's cybersecurity measures. They will prioritize network security risk management to protect sensitive data and intellectual property.</p>	5	5	1.5
<p>139.Sustainability and ethical technology adoption: chief technology officer will actively support sustainable and ethical technology practices, taking into account the environmental and social impacts of technology adoption. They will strive to achieve responsible artificial intelligence and data usage.</p>	4	5	2
<p>140.Customer centric innovation: chief technology officer will promote customer-centric innovation by focusing on user experience and ensuring that technological solutions meet customer needs. They will be at the forefront of developing personalized and seamless digital experiences.</p>	5	5	1

Prediction of the Future Role of chief technology officer	Mdn	Mo	IQR
141.Agility and flexibility: chief technology officer will adopt agile methods and promote an adaptive culture to quickly respond to market changes and constantly changing customer needs.	5	5	2
142.Collaboration with senior executives: chief technology officer will work closely with other executives, including the CEO, CFO, and CMO, to align technology strategy with broader business goals.	3	3	2
143.Talent management and skill enhancement skills: chief technology officer will play an important role in attracting and retaining top technical talents, ensuring that employees have the opportunity to improve their skills and continue learning.	5	5	1
144.Emphasize the innovation ecosystem: chief technology officer will explore partnerships, collaboration, and open innovation to create dynamic ecosystems, promote innovation, and acquire cutting-edge technologies.	5	5	1
145.Addressing Regulatory Challenges: chief technology officer will address complex regulatory environments and ensure compliance with data protection and privacy regulations.	5	5	1.5

Appendix E
Training Program

Training Program: Enhancing Chief Technology Officer Technical Management Capabilities

I. Training Objectives

Enhance the CTO's capabilities in managing enterprise IT infrastructure, data management and analysis, and information security.

Equip CTOs with the latest technology trends and tools to optimize enterprise technology management processes.

Develop key qualities and abilities that CTOs in high-tech enterprises should possess, including technical expertise, business acumen, team building, adaptability, innovation, and compliance management.

II. Training Participants

Enterprise CTOs and related technical management personnel

III. Training Duration

2 days (6 hours per day)

IV. Training Venue

On-site training room or external training institution

V. Training Methods

Lectures

Case studies

Hands-on exercises

Group discussions

VI. Training Content and Schedule

Day 1

1. Opening and Objective Introduction (30 minutes)

Welcome and self-introduction

Introduction of training objectives and schedule

Participant self-introductions and expectations

2. IT Infrastructure Management (1.5 hours)

2.1 Topic Introduction

Importance of IT infrastructure

Components of modern IT infrastructure

2.2 Key Content

Data center management

Network architecture and management

Cloud computing and virtualization technologies

2.3 Case Study and Discussion

Case Study: Optimization of a company's data center

Group Discussion: How to choose the right cloud service provider

3. Data Management and Analysis (1.5 hours)

3.1 Topic Introduction

Core concepts of data management

Data lifecycle management

3.2 Key Content

Data storage and backup strategies

Data analysis tools and technologies

Data governance and compliance management

3.3 Case Study and Discussion

Case Study: Data-driven business decision-making

Group Discussion: Best practices in enterprise data management

Lunch Break (1 hour)

4. Information Security Management (1.5 hours)

4.1 Topic Introduction

Importance and challenges of information security

Information security management systems

4.2 Key Content

Network security strategies

Data privacy and protection

Incident response and disaster recovery

4.3 Case Study and Discussion

Case Study: Handling a major data breach incident

Group Discussion: Formulating and implementing enterprise information security policies

5. Latest Technology Trends and Tools (1 hour)

Topic Introduction

Current and future technology trends

Selection and evaluation of technology tools

Key Content

Integrating new technologies into enterprise strategy

Evaluating ROI of technology tools

Case Study and Discussion

Case Study: Transformation through adoption of new technologies

Group Discussion: Application scenarios of future technologies

6. Course Summary and Q&A (30 minutes)

Review of key training content

Participants share learning insights

Q&A session

Closing remarks and thanks

Day 2

1. Opening and Objective Introduction (30 minutes)

Welcome and self-introduction

Introduction of training objectives and schedule

Participant self-introductions and expectations

2. Technical Expertise and Vision (1.5 hours)

Topic Introduction

The role of the CTO in technology

Developing and realizing a technology vision

Key Content

Latest technology trends

Innovation and R&D in technology

Technology project management

Case Study and Discussion

Case Study: Successful realization of a technology vision

Group Discussion: How to formulate a technology vision

3. Business Acumen and Strategic Thinking (1.5 hours)

Topic Introduction

Importance of business acumen

Applying strategic thinking in technology management

Key Content

Market analysis and technology positioning

Aligning technology strategy with business strategy

Technology investment and ROI analysis

Case Study and Discussion

Case Study: Driving business growth through technology strategy

Group Discussion: How to enhance business acumen

Lunch Break (1 hour)

4. Team Building and Collaboration (1.5 hours)

Topic Introduction

Importance of team building

Effective team collaboration strategies

Key Content

Leadership and management of teams

Cross-department collaboration

Motivation and performance management

Case Study and Discussion

Case Study: Successful team building in a technology context

Group Discussion: Improving team collaboration efficiency

5. Adaptability and Resilience (1.5 hours)

Topic Introduction

Adaptability and resilience in high-tech environments

Strategies for facing challenges and changes

Key Content

Change management

Crisis management

Continuous learning and development

Case Study and Discussion

Case Study: Successfully navigating technological change

Group Discussion: How to cultivate adaptability and resilience

6. Course Summary and Q&A (30 minutes)

Review of key training content

Participants share learning insights

Q&A session

Closing remarks and thanks

VII. Training Material Preparation

PPT slides

Relevant case study materials

Tools and environments for hands-on exercises

Discussion questions and reference answers

VIII. Training Evaluation

Post-training feedback questionnaire

Evaluation of hands-on exercises

Performance evaluation in group discussions

IX. Follow-Up

Establish a post-training support group to provide ongoing technical support

Organize regular meetings to share technical management experiences

Assess training effectiveness and continuously improve training content

Appendix F
Certificate of English

**BS
RU** BANSOMDEJCHAOPRAYA
RAJABHAT UNIVERSITY

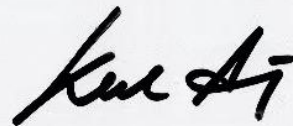
This is to certify that

Mr. Lyu Gaizhi

Achieved BSRU English Proficiency Test (BSRU-TEP) level

C1

Given on 25th January 2021



(Assistant Professor Dr Kulsirin Aphiratvoradej)

Director

Appendix G
The Document for Accept Research



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DR.KEN Institute of Academic Development and Promotion.

No. 139/26 Theenanon Road, Talad Sub-district, Mueang Mahasarakham District,

Mahasarakham Province, Thailand, 44000 Tel: +66946398978.

Website: <https://so07.tci-thaijo.org/index.php/IJSASR/index>



No. IJSASR.169

Date: 25 May 2024

Acceptance Letter

Dear: **Lyu gaizhi, Pong Horadal, Kanakorn Sawangcharoen, Sombat Teekasap**

Paper Title: **Leadership for sustainable growth of high-tech enterprises in Guangxi Province**

This is to enlighten you that the above manuscript was reviewed and appraised by the reviewer committee members of the **International Journal of Sociologies and Anthropologies Science Reviews (online)** [IJSASR], Old ISSN 2774-0366 (Online): New ISSN 2985-2730 (Online), indexed by **Thai Journal Citation Index Centre (TCI) Tier 2, DOI Crossref Member, and ResearchGate**. It is acceptable for publication in the IJSASR, which will be available in Volume 4 Issue 6 (November-December 2024) at <https://so07.tci-thaijo.org/index.php/IJSASR/about>

Sincerely

Asst. Prof. Dr. Sanya Kenaphoom
Editor-In-Chief



DR.KEN Institute of Academic Development and Promotion

No. 139/26 Theenanon Road, Talad Sub-district, Mueang Mahasarakham District,
Mahasarakham Province, Thailand, 44000 Tel: +66946398978. E-mail : dr.keninstitute@gmail.com
Website: <https://so07.tci-thaijo.org/index.php/IJSASR/index>

Researcher Profile

Name-Surname: Lyu Gaizhi
Birthday: 19, June, 1987
Place of Birth: Quanzhou County, Guilin City, Guangxi Province, China

Educational background:

- Doctor of Philosophy Program in Technology and Innovation Management, Bansomdejchaopraya Rajabhat University, in 2021.
- Master of Science Program in Mechanical Engineering, Guangxi University, in 2013.
- Bachelor of Science Program in Transportation, Guangxi University of Science and Technology, in 2007.

Work experience:

- Researcher, Guangxi Institute of Science and Technology Information, from 2012 to present.

Office Location:

- No. 24, Xinghu Road, Nanning City, Guangxi Province, China

Current Contact Location:

- No. 8, Fenglin Road, Nanning City, Guangxi Province, China