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MASTER'S QUALIFICATION THESIS

on topic:

“Anti-crisis management of an export-oriented enterprise”:

Specialty

073 “Management”

Educational program

Management of International Activity

Orientation of educational programme

educational and professional

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on implementation master's degree qualification thesis by graduate

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Source data for the master's qualification thesis: legislative acts, educational and scientific literature, financial statements of the enterprise, statistical data, technological maps, resolutions, orders

_____ List of questions, that subject to research:

1. Theoretical and methodological basis of crisis management for export-oriented enterprises
2. Analysis of CATL'S business activities in the international commercial environment
3. Ways to improve the CATL anti-crisis management system

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ANNOTATION

Master's thesis topic is: « Anti-crisis management of an export-oriented enterprise». In an era characterized by volatile global supply chains, geopolitical tensions, and accelerating technological disruptions, the ability to deliver robust crisis management has become critical to the survival and sustainable competitiveness of export-oriented enterprises. This study is a comprehensive case study by «Contemporary Amperex Technology Co., Limited» (CATL), a global leader in battery manufacturing , to systematically examine the development, implementation, and improvement of crisis management strategies. The study draws on established crisis management theory, primarily the 4R model (reduce, prepare, respond, recover), and integrates supply chain risk management principles to build a holistic analytical framework.

The purpose of the master's thesis is to theoretically substantiate and identify effective anti-crisis strategies and tools that will help improve and improve the anti-crisis management systems of the Contemporary company. Amperex Technology Co. , Limited (hereinafter referred to as “CATL”), which will help adapt to the globalized environment, ensure sustainable development and introduce innovations.

In accordance with the set goal, the following tasks are defined in the work: to study the theories and methodological approaches of anti-crisis management in an export-oriented enterprise; to study the assessment and identification of risks in export-oriented enterprises; consider methodological approaches to assessing the impact of the crisis on the functioning of the enterprise; provide a general description of CATL's activities, conduct a business review; conduct an assessment of the financial condition of the business and the risks of CATL's international supply chain; analyze the global market for batteries for electric vehicles; provide recommendations for the future anti-crisis management of the enterprise; to work out ways to improve the CATL crisis management system. In response to these challenges, the study proposes a multifaceted strategic framework for strengthening CATL's anti-crisis capabilities.

This master's qualification work consists of an introduction, three chapters, conclusions, a list of used literature and appendices. It is presented on 72 pages of computer text and contains 14 tables, 3 figures and 52 references.

Keywords: anti-crisis management; export-oriented enterprises; supply chain sustainability; CATL

РЕФЕРАТ

Тема магістерської роботи: «Антикризове управління експортно-орієнтованим підприємством». В епоху, що характеризується нестабільністю глобальних ланцюгів поставок, геополітичною напруженістю та прискоренням технологічних збоїв, здатність забезпечувати надійне антикризове управління стало критично важливим для виживання та сталої конкурентоспроможності експортно-орієнтованих підприємств. В магістерській кваліфікаційній роботі розглянуто компанію «Contemporary Ampere Technology Co., Limited» (CATL), світового лідера у виробництві акумуляторів, для систематичного вивчення розробки, впровадження та вдосконалення стратегій кризового управління. Дослідження спирається на усталену теорію кризового управління, насамперед на модель 4R (скорочення, підготовка, реагування, відновлення), та інтегрує принципи управління ризиками ланцюга поставок для побудови цілісної аналітичної основи.

Метою магістерської роботи є теоретичне обґрунтування та визначення ефективних антикризових стратегій та інструментів, які допоможуть покращити та вдосконалити системи антикризового управління сучасної компанії Ampere Technology Co., Limited (далі – «CATL»), що допоможе адаптуватися до глобалізованого середовища, забезпечити сталий розвиток та впровадити інновації. Відповідно до поставленої мети, у роботі визначено такі завдання: вивчити теорії та методичні підходи антикризового управління на експортно-орієнтованому підприємстві; провести оцінку та ідентифікацію ризиків на експортно-орієнтованих підприємствах; розглянути оцінку впливу кризи на функціонування підприємства; надати загальний опис діяльності CATL, провести огляд бізнесу; провести оцінку фінансового стану бізнесу та ризиків міжнародного ланцюга поставок CATL; проаналізувати світовий ринок акумуляторів для електромобілів; надати рекомендації щодо майбутнього антикризового управління підприємством; розробити шляхи вдосконалення системи кризового управління CATL. У відповідь на ці виклики в дослідженні пропонується багатогранна стратегічна основа для зміцнення антикризових можливостей CATL.

Ця магістерська кваліфікаційна робота складається зі вступу, трьох розділів, висновків, списку використаної літератури та додатків. Вона представлена на 72 сторінках комп'ютерного тексту та містить 14 таблиць, 3 рисунки та 52 посилання.

Ключові слова: антикризове управління; експортно-орієнтовані підприємства; стійкість ланцюга поставок; CATL

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INTRODUCTION

The relevance of this topic is related to With the deepening of globalization and profound changes in the international trade landscape, export-oriented enterprises are facing broad market opportunities, while also facing an increasingly complex and unstable external environment and systemic risks. The interaction of many factors, including geopolitical conflicts, rising trade protectionism, supply chain disruptions, fluctuating commodity prices, and escalating technological barriers, has made crises a common phenomenon rather than an exception in the international operations of enterprises. How to build an effective anti-crisis management system in this highly uncertain global business environment, thereby enhancing corporate risk resilience and recovery capabilities, has become a key issue for export-oriented enterprises seeking sustainable development and maintaining international competitiveness.

Anti-crisis management is not just a passive response to sudden incidents, but also a proactive strategic capability. Characterized by unpredictability, complexity, potential destructiveness and social impact, it requires enterprises to maintain flexibility and adaptability during crises, minimize losses and seek opportunities for transformation and growth. The master's research aims to provide theoretical support and practical recommendations for CATL and other export-oriented enterprises to build systematic, intelligent and resilient anti-crisis management systems, helping them move forward steadily in a turbulent global environment.

The purpose of the master's thesis is to theoretically substantiate and identify effective anti-crisis strategies and tools that will help improve and improve the anti-crisis management systems of the Contemporary company. Amperex Technology Co. , Limited (hereinafter referred to as “CATL”), which will help adapt to the globalized environment, ensure sustainable development and introduce innovations.

In accordance with the set goal, the following tasks are defined in the work:

- to study the theories and methodological approaches of anti-crisis management in an export-oriented enterprise
- to study the assessment and identification of risks in export-oriented enterprises
- consider methodological approaches to assessing the impact of the crisis on the

functioning of the enterprise.

- provide a general description of CATL's activities, conduct a business review
- conduct an assessment of the financial condition of the business and the risks of

CATL's international supply chain

- analyze the global market for batteries for electric vehicles
- provide recommendations for the future anti-crisis management of the enterprise
- to work out ways to improve the CATL crisis management system

The object of the study is the process of forming an anti-crisis management system using the example of the enterprise " Contemporary" Amperex Technology Co. , Limited .

The subject of the study is the theoretical, methodological and practical aspects of forming an effective anti-crisis management system at an enterprise.

Research methods: theoretical generalization, structural and comparative analysis, graphic and statistical interpretation, forecasting, logical synthesis and analysis based on specific cases. The information base includes academic literature, statistical data, international standards, corporate documents, analytical calculations, as well as reliable Internet sources, financial data of the company " Contemporary " Amperex Technology Co., Limited » .

The practical significance of the results lies in the possibility of applying the proposed recommendations to improve the efficiency and sustainability of CATL's global supply chain . These findings can help in decision-making, improve logistics performance, reduce risks and crises, and contribute to the overall development of the company in international markets.

The results of the study were approved at the VI International Scientific and Practical Online Conference for students, postgraduates and young scientists "Modern Management: Challenges and Opportunities" (Kyiv, NUBIP of Ukraine, November 4, 2025).

This master's qualification work consists of an introduction, three chapters, conclusions, a list of used literature and appendices. It is presented on 72 pages of computer text and contains 14 tables, 3 figures and 52 references.

SECTION 1. THEORETICAL AND METHODOLOGICAL BASIS OF ANTI-CRISIS MANAGEMENT FOR EXPORT-ORIENTED ENTERPRISES

1.1 Theory, essence, and significance of anti-crisis management in an export-oriented enterprise

The 4S crisis management theory was first proposed by American scientist Robert Heath in his book *Crisis Management*. He divided the content of crisis management into four stages: reduction, preparedness, response, and recovery, the purpose of which is to "reduce the force of attack and impact of a crisis scenario, prepare the organization to overcome a critical situation, strive to respond to the crisis that has arisen, and recover from it" [1].

First, there is the "Reduction" module, which is the main link in crisis management. By reducing risks, avoiding time losses, and optimizing the efficiency of resource allocation, the likelihood of a crisis can be significantly reduced and the extent of its damage mitigated. Strategies such as operational environment management, organizational structure optimization, process system iteration, and human resource configuration can be applied.

Second, there is the preparedness module, the central module of the crisis prevention and control system. It requires comprehensive consideration of various anti-crisis management factors, such as internal organizational structure, personnel management, resource allocation, as well as the external market environment, customer relations, public opinion in the media, etc. Readiness management focuses on building a risk prevention system. Specific ways include: forming cross-functional crisis response teams, developing standardized emergency action plans, and conducting regular crisis simulation exercises.

Thirdly, there is the response module. These are the processes for resolving crisis situations within the company, such as: crisis detection, isolation of emergencies, dynamic management, review, and assessment. During the recovery phase, the synergistic implementation of stakeholder communication mechanisms, public opinion shaping strategies, and brand reputation support plans can increase the effectiveness of emergency response actions.

Finally, there is the "Recovery" module. On the one hand, it includes restoring brand value and operational capacity during the post-crisis settlement phase; on the other hand, it includes analyzing experience and structured iteration of the system during the management improvement period. Businesses need to simultaneously explore opportunities to transform the crisis and build a path to growth that will surpass the pre-crisis state.

Based on Robert Heath's 4S theory, scientists have consistently enriched theoretical connotations. Barton [2] proposed a two-stage theory, focusing mainly on crisis prevention and resolution; Heath³ proposed a three-stage theory, the main points of which are pre-crisis management, crisis management, and post-crisis management; Mitroff [4], Claire, and Pearson [5] proposed a five-stage theory, the main points of which are identification of a crisis, preparation for a crisis, damage control, recovery from a crisis, and learning lessons from a crisis; Augustine proposed a six-stage theory, the main points of which are avoiding a crisis, preparing for crisis management, confirming a crisis, controlling a crisis, resolving a crisis, and profiting from a crisis. Jeffrey R. Caponigro considers the main points to be identifying and assessing an organization's weaknesses, preventing weaknesses from turning into crises, formulating crisis plans, confirming crises and taking action, effective communication during crises, monitoring and evaluating crises and making adjustments, strengthening the organization's reputation and credit, and isolating the enterprise from crises [7] .

Crisis management is usually defined as a series of countermeasures to overcome crises. Companies intervene in crisis events using a variety of methods to eliminate or reduce the negative impact on corporate reputation, survival, and financial condition when a crisis arises. It also includes preventing crises before they occur and restoring brand reputation after they occur. Scholars from different countries have largely unified the definition of crisis management, generally dividing it into three parts: prevention before the event, response during the event, and recovery after the event.

After studying managers, Jan I. Mitroff suggested that crisis management is not only a passive solution to emerging crises, but also the achievement of comprehensive crisis management. Managers must prepare in advance, before a crisis occurs, and in the

early stages of a crisis, take a series of measures to identify, analyze, and control the crisis, as well as communicate effectively. [8]. Japanese scientist Masao Tachibana has deep knowledge of risk control in crisis management. His main idea is that crisis management is not only a response to emergencies, but also the prediction of potential risks, their control, and the establishment of countermeasures [9]. Timothy Coombs believes that crisis management is a continuous process using organizational and managerial tools to prevent or reduce the damage caused by crises to the organization and its stakeholders, including four stages: crisis prevention, preparation, response, and recovery [10].

Crisis management has four main characteristics. The first is suddenness and flexibility. Suddenness and uncertainty are two key characteristics of crisis management. Crises usually arise suddenly without warning, leaving businesses with insufficient time to prepare adequately. After a sudden outbreak, a crisis develops rapidly, and under time pressure, managers must respond quickly, making decisions in a short time to combat the crisis and prevent its spread. Crisis events often depend on many factors, such as the political environment and market environment, which often leads to uncertainty about the direction of the event, the scale of its impact, and its consequences. Therefore, crisis management must also be flexible, responding quickly to changes in the crisis and formulating appropriate countermeasures to mitigate its impact.

The second is complexity and unpredictability. Crises are often multidimensional and dynamic, often involving the combined impact of the political, economic, and market environments, which increases the complexity of the crisis. The impact of a crisis is also usually multi-layered, affecting not only shareholders, managers, and employees of the enterprise, but also partners, suppliers, and others. A company's crisis management plan must also take into account stakeholders, which makes the decision-making process complex. Managers can formulate diversified response plans according to different types of crises; Unpredictability relates to adaptability in the crisis management process, which requires managers to monitor the crisis situation in real time as circumstances change during a crisis event and to dynamically adjust initial response strategies to address new challenges and opportunities.

The third is Destructiveness and Constructiveness. Given that crises have a dual nature of danger and opportunity, if crisis management decisions are wrong, it can be extremely destructive to an organization's cash flow, profitability, brand reputation, etc., plunging the company into a crisis of public opinion, reducing public confidence in the company and causing a decline in employee morale, negatively affecting the company; proper crisis management can also bring constructive opportunities for the organization, saving the company's reputation and using this opportunity to expand the company's influence and create opportunities. At the same time, proper crisis management can increase the resilience of the organization, allowing it to respond more calmly to future crises, and can also optimize internal management and production processes during crisis events, contributing to the development of the company.

Finally, there is Sociality and Diffusivity. Crisis management is not just an internal problem for a company; the outbreak of a crisis also affects the public and stakeholders, which are social in nature. Company managers must have a sense of social responsibility. Crisis response measures must take into account the interests of many parties, not only resolving their own crisis, but also protecting public interests, responding to social expectations, and improving brand image. Second, in the current era of developed online media, as soon as a crisis event occurs, it spreads rapidly, even affecting the entire industry and causing chain reactions. Anti-crisis management of an enterprise must be able to respond quickly to challenges caused by the spread of information.

For a huge number of export-oriented enterprises operating in the complex and ever-changing environment of global trade, the establishment of a systematic crisis management system is of profound practical significance. Most export-oriented enterprises, especially those that have developed rapidly in the wake of globalization, are still in the stage of researching crisis management, lacking systematic theoretical recommendations and practical experience. This study aims to identify universal anti-crisis management strategies by analyzing typical enterprises, helping export-oriented enterprises to form systematic response plans for different types of crises, achieve rapid response, thereby significantly reducing the impact of crises on their activities, and

ensuring the survival and sustainable development of enterprises.

The practical significance of this study for all export-oriented enterprises in the process of crisis management in international trade is reflected in three aspects. First, increasing the resilience of the supply chain. Using scientific models and methods to assess and improve the supply chain's ability to cope with risks, ensuring business continuity and stability in the face of global impacts. Second, optimizing crisis response strategies. Integrating and using digital technologies, such as big data and artificial intelligence, to create intelligent mechanisms for early risk warning and accurate response, achieving modernization and enhancing management capabilities. Third, building sustainable competitiveness. A robust crisis management system can not only help enterprises withstand crises, but also enable them to recover more quickly and strengthen their market position after a crisis, which has become an indispensable key advantage in the face of global competition.

In particular, for the sample of this study — CATL — the importance of strengthening its crisis management capabilities in international business is even more apparent. As a model of a technology-intensive and globally located supply chain, the crises faced by CATL are very indicative. Summarizing its anti-crisis management strategies, such as avoiding trade barriers through a "technology licensing" model, securing raw materials through global mineral blockades, and building a digital supply chain, not only directly provides a theoretical reference for strengthening its own crisis resilience, but its successful experience can also provide valuable practical templates for similar export-oriented enterprises facing the risks of technological blockade, geopolitics, and supply chain disruptions.

1.2. Risk assessment and identification in export-oriented enterprises

Engaging in export is, by its very nature, a process associated with various risks; exporting enterprises can only mitigate the impact of these risks, but cannot completely eliminate them [11]. Therefore, for enterprises, especially those whose products are primarily oriented towards export markets, export risk management is crucial for

controlling costs, reducing losses, and ensuring profits.

Mr. Xiu and Yu (2022) argue [12] that the risk for Chinese exporting enterprises concerns the possibility that the actual performance of their export business will deviate from the expected target due to the influence of uncertain factors. These uncertain factors, based on the boundaries of the enterprise, include both internal and external elements. Accordingly, the risks faced by export enterprises can also be classified into internal and external risks. Among them, internal risks primarily include those related to cost, strategy, brand recognition, etc., while external risks mainly cover political, legal, economic, social, and technological risks, as well as risks from trading partners, suppliers, logistics companies, etc.

Xue Xu (2017) argues that international trade risk management, i.e., the function of managing export risks, mainly includes risk warning, assessment, prevention, response, and strengthening risk prevention capabilities. He outlined the basic process of international trade risk management, which mainly includes risk identification and risk assessment, as well as the application of reasonable response strategies to warn about risks in order to ensure that export enterprises achieve the expected level of profit. He also considers risk identification as the basis and starting point for international trade risk management. The two main objectives of international trade risk identification are to identify the causes of risks arising in the process of international trade and to assess the characteristics of risk occurrence. The risk identification process involves identifying and assessing potential risks and confirming the losses that result from them. Risk assessment involves conducting a risk assessment based on risk identification, analyzing the information collected, using mathematical methods to calculate the probability of risk occurrence, and assessing the degree of loss. In other words, risk assessment can be seen as a further study of risk identification. Effective risk response can only be implemented after a relatively accurate risk assessment. Finally, risk warning involves issuing an early warning signal based on the probability of a risk occurring in international trade, prompting preventive measures to be taken in accordance with the results of the above-mentioned risk identification and assessment that reach a certain level. Export enterprises can establish export risk warning lines based on their actual situation. For those with higher risk levels, risk response plans should be prepared in advance. After issuing risk warnings, export enterprises should also use

reasonable methods to continuously monitor the development of risks, maintaining comprehensive and holistic monitoring of export risks. Although different scholars have different views on the division of the risk management process or workflow, in general, several processes are important: namely, risk identification, risk assessment, and risk management measures. In addition, some include risk warnings, while others include processes such as evaluating the effectiveness of risk management measures.

In the context of rapid global economic development, the uncertain risks faced by supply chain systems are becoming increasingly apparent. To address this issue, the academic community has gradually introduced the concept of supply chain risk into the field of supply chain research. In 1987, Shapira first proposed the concept of supply chain risk management, laying the foundation for research in this field [14]. Supply chain risks exist in numerous links, from the initial purchase of raw materials to the final distribution of finished products [15].

Regarding supply chain risk management, Fan, Y (2018) provided the following definition: Supply chain risk management is a process in which companies use internal tools, methods, and strategies, as well as establish coordination mechanisms with cooperative companies in the supply chain to identify, assess, process, and monitor potential risks in an effort to enhance the resilience of the supply chain, thereby gaining a competitive advantage for the enterprise [16]. In addition, Chen Jinxiao (2021) further noted that supply chain risk management must take full account of the structure of the supply chain, the risk preferences of decision-makers, and emergency and crisis management, among other aspects [17].

As a key component of supply chain risk management, the effective implementation of supply chain risk identification and assessment must follow a rigorous methodological framework. This process begins with the systematic identification of potential risk factors throughout the supply chain process. This fundamental work includes a comprehensive study of risk sources, accurate identification of risk characteristics, and in-depth analysis of mechanisms of action, which ultimately forms a structured risk classification system and quantitative indicators. Based on the premise of ensuring the scientific nature and functionality of the assessment system, it is necessary to create a comprehensive risk assessment system and select appropriate methodologies for establishing assessment models.

Based on existing academic research and business practices, various mature methodological tools have been developed in the field of supply chain risk assessment . Each of these assessment methods has its own characteristics. Among them, the expert assessment method effectively copes with the quantitative assessment of qualitative risk factors by aggregating the empirical judgments of experts in the subject area; the analytical hierarchical process (AHP) achieves a ranking of the relative importance of complex risk factors by constructing a hierarchical structural model and assessment matrices. For risk factors with incomplete data, the expert assessment method can be used for preliminary assessment; for quantitatively measurable risk indicators, AHP can be applied for accurate calculation. This multi-method integrated assessment strategy can balance completeness and accuracy, providing a reliable basis for supply chain risk management decisions.

Given the diversity of crisis phenomena and the many ways in which they manifest themselves, various anti-crisis management methods can be used both in relation to individual parameters of the crisis phenomenon and to the crisis situation as a whole.

In economic literature, anti-crisis management methods are divided into two groups:

- The first group consists of tactical methods. These methods are aimed at quickly improving the financial performance of the enterprise, i.e., overcoming the consequences of the crisis.
- The second group consists of strategic methods. The application of strategic methods is aimed at improving the qualitative characteristics of the enterprise's activities.

Table 1.1 provides a systematization of tactical methods of anti-crisis management of an enterprise that contribute to improving its financial performance, but in most cases these methods are insufficient to eliminate the cause of the crisis – an ineffective management system. This requires the use of longer-term measures, i.e., the application of strategic methods.

Table 1.1

Tactical methods of anti-crisis management of an enterprise

Name	Essence of the method	Main objective
Downsizing	Ability to adapt to conditions internal and external environment by reducing production capacity in line with actual demand and market opportunities.	Reduction of fixed costs and reducing the cost of production.
Reorganization	A set of financial, economic, technological, organizational, and social measures nature, aimed at improving financial performance by changing the structure of the company's assets and liabilities	Restoration of liquidity, solvency, profitability and competitiveness.
Monitoring	Research, assessment, and forecasting of the state of the the external environment in the course of activities.	Early detection of crises, and "its weak signals."
Controlling	Analysis and coordination of program implementation in compared to planned indicators.	Acceleration of the detection crisis phenomena

Source: compiled by the author based on [39].

The results of applying strategic methods are not usually felt immediately by the enterprise, but they change the essence of the business and its qualitative characteristics: competitiveness and investment attractiveness.

For example, in the event of a crisis prevention, the key direction of strategic decisions of the management is implemented within the framework of the strategy of forming financial resources, financial support for sustainable growth, and achieving financial security. At the same time, management measures are aimed at:

- support for investment in technological processes,
- solvency through control over buyer payments;
- justification of the feasibility of investment projects;
- increasing own funds or attracting investments [39, 12].

The systematization of strategic anti-crisis methods for enterprises is presented in Table 1.2, which shows that the development and adoption of management Decisions are made in accordance with the strategic goal of anti-crisis measures for a specific enterprise, namely: prevention, neutralization (stabilization), or overcoming (elimination) of crisis phenomena at the enterprise.

Table 1.2

Strategic methods of anti-crisis management of an enterprise

Name	Essence of the method	Purpose
Diversification	Expanding the scope of activities in order to avoid dependent on a single market, applied at the first signs of crisis	Mergers within one enterprise to save costs.
Regularization	Formation of strategic planning and management accounting; creation of a comprehensive financial control and planning system; creation of a modern accounting information system; introduction of marketing services.	Management system for solving a large number of strategic tasks, entering international markets
Reengineering	Redesign of business processes through reduction of unnecessary links and operations in business processes, unnecessary expenditure of time and resources.	A sharp increase in all Performance indicators
Restructuring	Implementation of organizational, economic, legal and technical measures aimed at changing the organizational structure of the enterprise's management, which will ensure its financial recovery, increase product sales, and improve production efficiency.	Overcoming the causes of strategic crisis and profitability crisis.

Mergers	Merger of companies resulting in The owners of the merged companies will control all the net assets of the merged companies.	Shared allocation of risks and benefits of the merger.
Liquidation	Termination of the enterprise's activities and its removal from the registers.	Satisfaction of creditors' claims creditors.

Source: compiled by the author based on [38].

If the goal of crisis management is to neutralize (stabilize) the crisis, then management decisions are made within the framework of a strategy for forming financial resources, providing financial support for accelerated growth, ensuring financial security, and achieving financial stability. These decisions are aimed at balancing the methods of attracting financial resources in order to minimize risks and ensure expansion of product sales.

1.3. Methodological approaches to assessing the impact of the crisis on the functioning of the enterprise.

Crisis management is based on a thorough analysis of the financial and economic condition of the enterprise and the development of anti-crisis measures, which allows the enterprise to predict and avoid bankruptcy, as well as to increase the efficiency of its activities. Preventing bankruptcy depends on the timely detection of the threat of bankruptcy at the enterprise.

To prevent a crisis, it is very important to identify the signs of a future problem situation in a timely manner. Therefore, it is extremely important for the head of the enterprise and managers to be able to competently predict the causes and sources of crisis situations and to have a pre-designed mechanism for resolving them.

In global practice, various economic and mathematical models are used to forecast the stability of an enterprise's operations, select its financial policy, and determine the risk of bankruptcy. Modern economic science has a large number of various techniques and methods for forecasting financial indicators, including in terms of assessing possible bankruptcy. Let us consider the most common methods and models for forecasting a

crisis in an enterprise.

One of the first attempts to use analytical ratios to predict bankruptcy is considered to be the work of W. Weaver, who analyzed 30 ratios over a five-year period for a group of companies, most of which went bankrupt (Weaver 1966). All ratios were grouped into six groups, and the study showed that the most significant indicator for forecasting was the ratio of cash inflows to capital employed [37]. The most well-known work in this area is that of Western economist Altman, who developed a method for calculating a creditworthiness index using multiplicative discriminant analysis (Aitaap, 1968). This index allows economic entities to be divided in advance into potential bankrupts and non-bankrupts. This method is known as Altman's Z-model. In 1968, a five-factor forecasting model was proposed – the so-called Altman Z-score model. It is a function of certain indicators that characterize the economic potential of an enterprise and its performance for the reporting period, where n varies from 1 to 5.

Altman's five-factor model looks like this:

$$Z = 1.2 \cdot X_1 + 1.4 \cdot X_2 + 3.3 \cdot X_3 + 0.6 \cdot X_4 + 0.999 \cdot X_5,$$

where X_1 is the ratio of working capital to the company's assets;

X_2 – ratio of retained earnings to assets; X_3 – return on assets;

X_4 – ratio of equity to debt capital;

X_5 – ratio of revenue from sales to assets [1] For the Altman model, depending on the value of the Z-factor, the following is defined

Table 1.3

Scale of probability of bankruptcy of an enterprise

Z value	Probability of bankruptcy
$Z < 1.8$	Very high
$1.8 \leq Z \leq 2.7$	high
$2.7 \leq Z \leq 2.9$	medium
$Z \geq 3.0$	series

Source: [1, 39].

The accuracy of Altman's five-factor model forecast within one year is 95%, within two years – up to 83%, which is an advantage of this model.

Of course, deviations from the criterion value are possible, so Altman identified

an interval (1.81-2.99) called the "zone of uncertainty" (Table 1.3). Falling outside this zone with a very high probability allows us to draw conclusions about the company: if $Z < 1.81$, then the company can be classified as potentially bankrupt; if $Z > 2.99$, then the conclusion is directly opposite. The accuracy of the forecast in this model is 95% within one year and up to 83% within two years, which is an advantage of this model. The disadvantage of this model is that it can be used mainly for large companies.

The model developed by Altman in 1977 allows predicting bankruptcy for 5 years with an accuracy of 70% and includes the following indicators: return on assets, profit dynamics, coverage ratio (liquidity), autonomy ratio, total assets.

The advantage of this model is its maximum accuracy. However, its application is complicated by a lack of information (the necessary analytical accounting data is not available to external users).

In the event of overcoming (eliminating) crisis phenomena at the enterprise, a strategy for achieving financial security and preventing bankruptcy is implemented, within which management decisions are aimed at saving investment resources by selecting promising business projects and conserving capital-intensive projects.

It is important for managers not only to develop anti-crisis management decisions, but also to assess the feasibility and effectiveness of implementing anti-crisis measures to prevent bankruptcy.

Methods for evaluating the effectiveness of anti-crisis management measures are presented in Table 1.4.

Table 1.4

Methods for evaluating the effectiveness of crisis management measures

Group of methods	Name of the method (model) for assessing effectiveness
Quantitative	Economic and statistical
	Methods of financial and economic analysis
	Economic and mathematical methods and models
Qualitative	Methods of individual expert assessment
	Methods of collective expert assessment
	Statistical methods for processing qualitative data
	Methods for solving multi-criteria problems

Mixed	Methods of multidimensional scaling
	Fuzzy logic methods

Source: compiled by the author based on [37].

In today's closely interconnected global economy, supply chain crises have become a key external shock affecting the operations and strategic decisions of exporting firms. This article systematically analyzes how supply chain crises affect the business of exporting firms through three theoretical mechanisms: demand, cost, and risk.

Supply chain crises significantly alter the structure of demand in the international market, disrupting the operation of global production and logistics networks. In the early stages of a crisis, production disruptions and uncertainty in delivery times lead to foreign customers canceling or postponing orders, which directly affects the short-term revenue of export companies [18]. For a company such as CATL, whose products (batteries) are highly complex industrial goods that depend on a global supply chain of raw materials (such as lithium, cobalt, nickel) and components, any disruption in a critical link can directly affect its production capacity and export capabilities. This could make it impossible to meet the needs of international customers such as Tesla and BMW. Such short-term operational uncertainty forces companies to shift their management focus from long-term research and development planning to addressing immediate supply issues, thereby diverting resources and attention away from technological innovation [19].

In the long term, supply chain crises may contribute to trends toward "supply chain regionalization" or "localization." To ensure the security of their own supply chains, international customers tend to seek suppliers that are geographically closer or have lower political risks²⁰. This structural change on the demand side may create problems for companies such as CATL, which rely on technological leadership but have extensive global supply chains. Some lower-tier manufacturers may turn to local or other regional second-tier battery suppliers for support. Although the technology of these alternatives may be slightly inferior, their supply stability is higher. This shift in the market environment weakens the business logic of leading companies that set premium prices through continuous technological innovation. To maintain market share,

companies may be forced to shift their strategic focus from disruptive innovation to ensuring production stability and cost competitiveness. In the long term, this will slow down the pace and ambition of their technological iteration [21].

The main manifestation of supply chain crises is the obstruction of global factor mobility, leading to an across-the-board increase in raw material, logistics, and production costs. This mechanism directly squeezes the profit margin of exporting companies [22]. According to factor endowment theory, even if a country has an advantage in a particular factor, disruptions in the global supply chain can significantly reduce that advantage. CATL is heavily dependent on imported high-purity lithium resources. When supplies from major lithium-exporting countries are constrained due to events such as pandemics or trade policies, global lithium prices rise sharply, directly increasing its most important production costs.

In addition, crisis-induced logistical bottlenecks (such as a shortage of shipping containers and port congestion) lead to a sharp increase in transportation costs and longer delivery cycles [23]. To cope with supply chain uncertainty, companies are forced to increase their safety stock levels, which in turn ties up significant working capital and increases storage and fixed capital costs. Faced with such comprehensive cost pressures, companies' financial resources are becoming depleted. Under short-term survival pressure, management is more inclined to allocate limited funds to ensuring supply chain security and supporting production than to invest in research and development, which is characterized by long payback periods and high uncertainty [37]. Although in theory cost pressures may force companies to pursue innovative processes to improve efficiency, for a technologically advanced company such as CATL, maintaining its technological leadership requires large-scale, forward-looking investments in basic research and development. Such investments are most likely to be postponed or reduced during periods of high costs.

The essence of the market mechanism includes a risk mechanism. Supply chain crises significantly increase the uncertainty faced by exporting companies in their operations, markets, and financing, pushing their decision-making models toward conservatism [25]. Technological innovations themselves are characterized by long cycles, significant investments, and high failure rates, making them high-risk activities even in a stable environment. With the high uncertainty caused by supply chain crises,

their risk factor is multiplied.

For CATL, the risks manifest themselves in several dimensions: first, there is "supply risk," which concerns whether key raw materials and technical equipment can be obtained on time and in sufficient quantities [26]. Second, there is "market risk," where unstable delivery schedules may prompt foreign customers to seek alternatives and demand compensation, damaging the company's reputation and long-term orders. Third, there is "exchange rate risk," as global macroeconomic policies adopted in response to the supply chain crisis may cause sharp fluctuations in exchange rates, affecting the actual profits from export orders calculated in US dollars. These interrelated risks seriously undermine the risk appetite of enterprise management [27].

In this context, the rational choice for companies is "cash is king" and "survival above all else." They prioritize defensive strategies such as reducing investment lines, strengthening cash flow management, and focusing on stable production and supply of existing products [28]. Long-term research and development projects aimed at developing breakthrough technologies, such as next-generation solid-state batteries or sodium-ion batteries, although crucial for future competitiveness, may be seen as a "luxury" and postponed in the current environment due to their huge investment needs and inherent uncertainty. Therefore, by increasing the risk premium, supply chain crises systematically discourage exporting companies from engaging in technological research and innovation.

Thus, crisis management is an organized management process aimed at the stable functioning and sustainable development of an enterprise based on the use of an effective system of methods for identifying and preventing a crisis situation in the enterprise and avoiding bankruptcy.

SECTION 2. ANALYSIS OF CATL'S BUSINESS ACTIVITIES IN THE INTERNATIONAL COMMERCIAL ENVIRONMENT

2.1 CATL's main activities, business overview

The growth of Contemporary Amperex Technology Co. , Limited (CATL) marks a significant milestone in the global energy and transportation revolution. Since its establishment in 2011, the company has rapidly transformed from a Chinese battery manufacturer to the undisputed leader in the global energy battery industry. The core of its business strategy is to build an ecosystem based on technological innovation and covering the entire industry chain, thereby ensuring its sustainable leadership in the face of fierce competition.

CATL operates as a global giant with a significant organizational infrastructure. The company employs over 131,988 people worldwide, with 20,346 of them engaged in research and development (15-16% of the total workforce). The production facilities are spread across 13 plants (10 in China and one each in Germany, Hungary, Spain and Indonesia), complemented by 6 major R&D centers and offices in France, Germany, Japan and North America [1].

CATL represents a model of a global technology leader from China, combining aggressive growth, a diversified business model and strategic partnerships. The company generates profits above competitors through technological innovation, economies of scale and operational excellence, despite price pressure in the battery market in 2024-2025. The management structure remains focused, with the founder holding 22.61% of the shares and actively guiding the development strategy.

The company's business landscape consists of three main pillars: power battery systems, energy storage battery systems, and battery materials and recycling. Among them, power battery systems constitute the absolute core of the business, accounting for more than 70% of operating income and strengthening its market position. CATL has adopted a forward-looking "multi-faceted" strategy in its technology roadmap. It has continuously improved ternary lithium batteries to achieve higher energy density, meeting the market demand for longer driving

range. At the same time, it has revived the competitiveness of lithium iron phosphate (LFP) batteries through structural innovations such as the landmark Cell-to-Pack (CTP) technology and " Qilin Battery ", which has significantly increased energy density along with their advantages in safety, service life and cost. In addition, the company has taken the lead in commercializing sodium-ion batteries. This serves not only as a strategic hedge against lithium resource supply risks, but also as an early step to secure positions for future diversified application scenarios [29].

To meet the huge market demand, CATL has established an extremely extensive global manufacturing and R&D network.³⁰ By the end of 2024 the company has deployed 13 major manufacturing bases and 6 major innovation and R&D centers around the world.

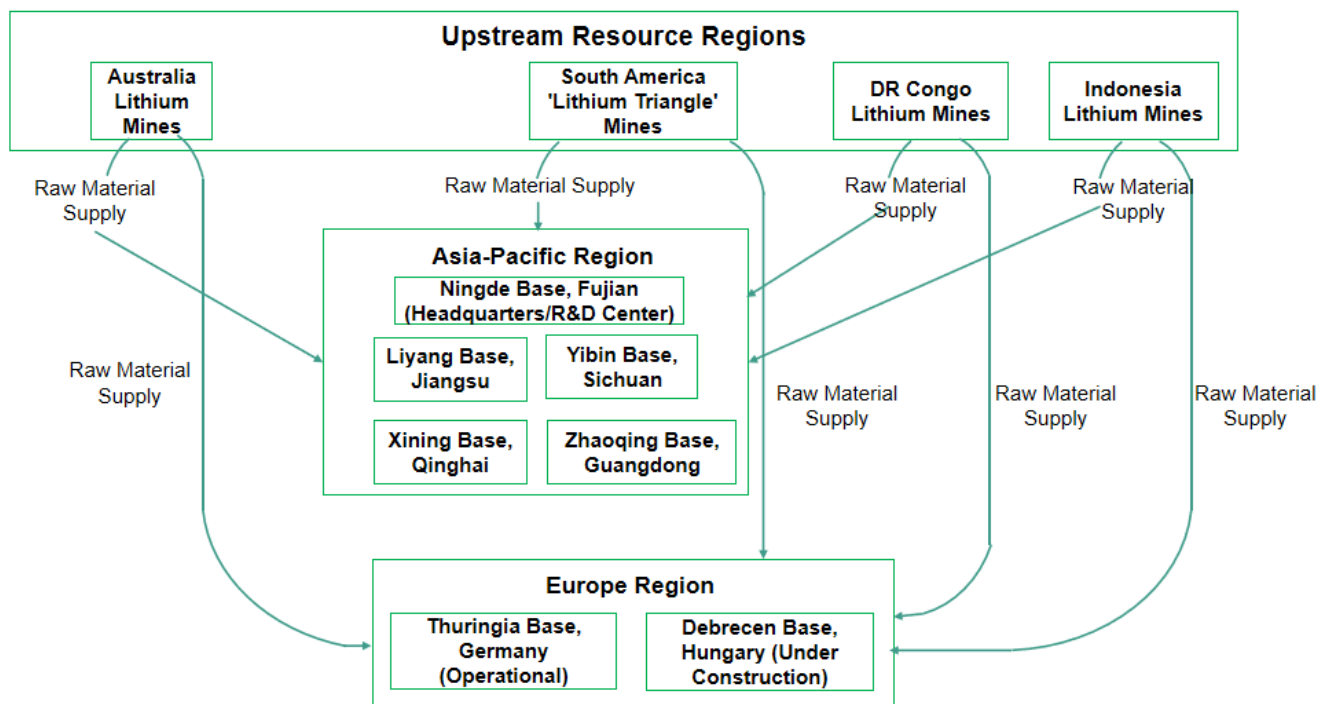


Fig. 2.1. CATL Global Business Structure

Source: [41, 52]

This network has not only significantly reduced production costs through economies of scale, but also fostered supply chain resilience and rapid response capabilities, achieved through customer-facing localization and continuous

technological iteration. Building on this foundation, CATL's customer relationships have gone beyond simple supplier-buyer dynamics to deep strategic partnerships. From domestic players such as Tesla, NIO, and Li Auto, to international giants such as BMW, Mercedes-Benz and Volkswagen, the vast majority of global automakers have integrated CATL into their core supplier systems. Some have even formed closely-knit industrial alliances through joint ventures and jointly established plants. This has strengthened its position, leading to a dominant global market share of 37.4% in 2023.

This strong operating foundation has directly led to exceptional financial performance. CATL's financial statements clearly reflect the characteristics of an industry leader in a rapid growth phase: rapidly expanding scale, stable profitability, and significant, sustained investment in future growth.

Table 2.1.

Comparison of CATL's key financial and operational indicators (2020-2023)

Indicator	2020 year	2021 year	2022 year	2023 year
Operating income (billion yuan)	503	1304	3286	4009
Net profit attributable to shareholders of the parent company (billion yuan)	56	159	307	441
Investment in research and development (billion yuan)	36	77	155	183
Investment in research and development as a % of revenue	7.1%	5.9%	4.7%	4.6%
Global battery market share	24.0%	32.6%	37.0%	37.4%
Total assets (billion yuan)	1527	3077	4012	4400

Source: CATL annual report [41].

The company's revenue growth curve is extremely steep, soaring from approximately 503 billion yuan in 2020 to 4,009 billion yuan in 2023. This

exponential growth is the result of the combined impact of the global new energy vehicle market explosion and the company's continuous growth in market share. More importantly, the company has maintained high profitability alongside this expansion of scale. In 2023, its net profit attributable to shareholders of the parent company reached 44.1 billion yuan. Although fluctuations in raw material prices affect its gross margin to some extent, the company has consistently maintained gross margins well above the industry average thanks to its technology premium, robust supply chain management capabilities, and economies of scale. This demonstrates its difficult-to-replicate comprehensive cost control and product pricing capabilities.

The foundation of these outstanding results is the company's continued significant investment in R&D. In 2023, CATL's R&D expenditure reached 18.3 billion yuan. This significant investment ensures the rapid iteration of its technology roadmap and the creation of patent barriers. This strategic thinking of "investing today to win tomorrow" is the fundamental source of its long-term competitiveness. From a balance sheet perspective, by the end of 2024, the company's total assets exceeded 440 billion yuan, providing a solid capital foundation for its global expansion. In terms of cash flow, the company's core business demonstrates very strong self-generating ability ("blood-forming" ability) with sufficient cash flow from operating activities sufficient to support its large-scale investment in capacity and R&D expenditure, demonstrating a healthy and self-sustaining financial cycle.

After establishing a dominant position in the domestic market, CATL's globalization strategy has been comprehensively deepened, evolving from the initial "export of products" to "localized operations." Its overseas business has become a second growth engine, driving future expansion, and a key initiative to reduce geopolitical risks.

In the early stages, the company mainly served overseas customers through a domestic production and direct export model. Today, CATL has successfully transformed from a battery supplier to a global strategic partner for major

international automakers. Its products have reached more than 60 countries and regions around the world, and it has entered into long-term agreements with traditional giants such as BMW, Volkswagen and Ford , as well as new leaders such as Tesla . Particularly innovative is the cooperation model with Ford , which involves "technology licensing" to provide technical approvals and services for Ford's plant in the United States. This approach skillfully circumvents potential political barriers associated with direct investment, paving a new path for technology-based global expansion.

In order to get closer to customers, reduce logistics costs and avoid trade barriers, CATL has been actively promoting the construction of localized overseas production facilities . Its plant in Thuringia, Germany, as its first overseas base, began operation in 2022, directly supplying products to German automobile giants. In addition, the planned plant in Debrecen, Hungary is expected to become its largest overseas production base in Europe and, indeed, the world, further strengthening its position in the European market. This series of location plans show that CATL is building a localized ecosystem that integrates R&D, manufacturing and sales on a global scale.

However, the path of overseas expansion is not without challenges. The company faces geopolitical risks, the challenge of reconstructing the entire supply chain system overseas, and the difficulties of cross-cultural integration and management. Judicious handling of these risks and balancing global efficiency with operational security will be the decisive test that will determine whether CATL can truly transform from a “world-class company from China” to a “great global company.”

2.2 Business status and risks of CATL's international supply chain

Contemporary Amperex Technology Co. , Limited (CATL) is a Chinese battery manufacturer and technology company founded in 2011, specializing in the production of lithium-ion batteries for electric vehicles and energy storage systems, as well as battery management systems (BMS). [3] CATL is the world's largest manufacturer of electric vehicles and rechargeable batteries, with a global market share of approximately 38% and 36.5%, respectively, in 2025. [4] It is headquartered in Ningde , Fujian Province . [5]

As a world-renowned innovator in lithium battery technology, Contemporary's supply chain network Amperex Technology Co. , Limited "CATL" is of great strategic importance to support its strategic development, respond to the needs of the global market and promote the development of the industry ecosystem. Its supply chain system comprehensively covers the entire value chain, from raw material supply to mid-line battery production and product distribution, forming a typical network structure [6]. This closed-loop supply chain system starts with the procurement of raw materials and components, proceeds through the manufacturing process, and delivers products to downstream customers through a customized distribution network. It covers the entire business process from strategic planning, raw material procurement, and production to logistics, distribution, and processing. This process involves multiple actors, including downstream raw material suppliers, downstream service and service providers, and processing companies. Within this complex supply chain network, multi-level and multi-dimensional cooperative relationships are formed between node enterprises.

CATL's financial performance is expected to show a non-linear trend between 2022 and 2024. The company's revenue peaked in 2023 (USD 56.65 billion), but declined by 11.02% to USD 50.41 billion in 2024. This decline may be due to changes in the demand structure for batteries, lower raw material prices, and increased competition in the global electric vehicle market .[41], [43].

However, profitability indicators show steady growth despite revenue fluctuations. Gross profit increased by 26.38% over three years, indicating an improvement in gross margin due to optimization of production costs. Operating profit increased by 63.16%, and net profit by 54.82%, indicating high efficiency in managing operating and non-operating expenses.

Table 2.2

CATL Income Statement Key Figures (in USD million)

Indicator	2022	2023	2024	Absolute gain 2022–2024	Growth rate 2022–2024, %
Receipts	48800.0	56650.0	50410.0	+1,610.0	+3.30%
Gross profit	9508.0	10842.0	12016.0	+2,508.0	+26.38%
Operating profit	5467.0	7590.0	8920.0	+3 453.0	+63.16%
Net profit	4564.0	6234.0	7066.0	+2 502.0	+54.82%

Source [40, 41]

Marginal analysis shows significant improvements in the efficiency of CATL's business model. Gross margin increased by 4.35 percentage points, which may be a result of:

- Reduction in the cost of key components (lithium, cobalt);
- Improving the technological process and reducing production waste;
- Increasing the share of high-margin products (e.g., batteries with LFP technology).

Operating margin increased by 6.49 pp, exceeding gross margin growth. This demonstrates effective control of operating expenses, in particular research and development expenses, as well as general and administrative expenses.

Net margin reached 14.02% in 2024, a record for the company and significantly higher than the industry average. This reflects CATL's strong negotiating position with customers and suppliers, as well as effective tax planning.

Table 2.3 .

CATL profitability indicators (in %)

Margin	2022	2023	2024	Absolute change 2022–2024
Gross margin	19.48	19.14	23.83	+4.35 pp .
Operating margin	11.20	13.40	17.69	+6.49 pp .
Net margin	9.35	11.00	14.02	+4.67 pp .

Source [40, 41]

CATL's total assets grew by 22.76% over three years, consistent with its aggressive capacity expansion strategy . Current assets grew by 23.38%, with cash and cash equivalents increasing from USD 28.4 billion (2022) to USD 42.3 billion (2024), reflecting a strong liquidity position. Non-current assets grew by 21.63%, driven by investments in new production lines, research centers, and acquisitions of intangible assets (patents, technologies).

Shareholders' equity increased by 40.77%, significantly exceeding the growth rate of assets. This indicates a pragmatic financial policy aimed at strengthening the capital base. The autonomy ratio (equity/assets) increased from 0.274 (2022) to 0.314 (2024), indicating a decrease in dependence on external sources of financing.

Total liabilities increased by only 13.55%, while the debt structure changed: current liabilities remained virtually unchanged (+0.64%), while non-current liabilities increased by 43.31%. This may be due to the issuance of long-term bonds to finance capital investments.

Table 2.4

CATL Cash Flow Indicators (in USD million)

Indicator	2022	2023	2024	Absolute growth 2022–2024	Growth rate 2022–2024, %
Operating cash flow (CFO)	9,091.0	13 115.0	13,504.0	+4 413.0	+48.54%
Capital investments	-7,162.0	-4,751.0	-4,342.0	+2,820.0	-39.38%

Free Cash Flow (FCF)	1,929.0	8,364.0	9,162.0	+7 233.0	+374.96%
Change of funds	12,197.0	11,376.0	4,456.0	-7,741.0	-63.47%

Source [40, 41]

Free Cash Flow Analysis: Free cash flow grew by an impressive 374.96%, the most significant achievement of the period. This demonstrates:

- Reduction in capital investment after the completion of the main phase of production expansion;
- Increased operational efficiency, which generates excess cash;
- Possibility of paying dividends, buying back shares or making new strategic investments.

Operating Cash Flow Analysis. Operating cash flow increased by 48.54%, indicating improved conversion of profit into cash. The operating cash flow to revenue ratio increased from 18.63% (2022) to 26.79% (2024), indicating high quality of earned profit.

CATL demonstrates high financial resilience and adaptability to changing market environments. Despite a decline in revenue in 2024, the company was able to:

- Significantly improve margins at all levels (gross, operating, net);
- Strengthen the liquidity position (current ratio 1.61, cash 42.3 billion USD);
- Reduce the debt burden (from 0.71 to 0.65);
- Generate record free cash flow (9.16 billion USD).
- Such results indicate an effective anti-crisis strategy based on operational efficiency, rather than on external capital raising.

To support its global manufacturing capacity structure, CATL has established a sophisticated and highly internationalized raw material supply system. The core of this system is global procurement and strategic control of key minerals such as lithium, cobalt, nickel and graphite. Currently, the company still relies heavily on cross-border procurement from global resource regions such as Australia, the South American “lithium triangle”, the Democratic Republic of the Congo (DRC) and Southeast Asia.

While this global procurement network secures the sources of materials, it also directly exposes the company to challenges such as geopolitical risks, sudden changes in trade policies and disruptions in long-distance international logistics.

Faced with a complex international environment, CATL has adopted a “global sourcing with moderate concentration” strategy for its suppliers of core materials such as cathode materials and separators. This system plays a crucial role in stabilizing supply and controlling costs. For example, the company uses differentiated purchasing strategies, flexibly adjusting the ratio of high-quality, medium-quality and low-quality materials to meet the diverse needs of different markets, ranging from premium European models to mass-produced electric vehicles around the world. However, differences in product performance parameters between suppliers in different countries pose a constant challenge for CATL in maintaining high quality stability of the final products supplied to its plants around the world. To address this issue, the company is closely integrating with major global suppliers through strategic investments and long-term agreements, seeking to strengthen its negotiating power in transnational procurement and enhance supply chain resilience, thereby providing critical support for the stable operation of its overseas bases in Germany, Hungary and other countries.

Recycling Market and Circular System in CATL's International Business . In the international recycling and recycling market, CATL's strategy has gone beyond simple product exports, transforming into strategic partnerships characterized by "deep integration and joint research and development" with leading global automakers. By meeting the differentiated needs of different markets such as Europe and North America in terms of performance, cost, and regulations (such as carbon footprint requirements), CATL offers customized battery system solutions for international customers such as BMW, Mercedes-Benz, and Tesla. This flexible product strategy has successfully introduced the company to the electrification platforms of major global automotive giants.

In the area of resource recovery, taking into account increasingly stringent international battery regulations and environmental standards, especially in the EU, is a vital part of CATL's global strategy. The company is actively deploying battery

recycling networks overseas. By recycling spent lithium-ion batteries to extract valuable metals such as nickel, cobalt and manganese, it aims to create a closed loop transnational circular economy based on the “global resources – local production – regional recycling” model [31]. This not only mitigates raw material supply risks, but also meets EU legal requirements for the mandatory use of recycled materials in batteries. However, the implementation of overseas recycling operations creates more pronounced “cleanliness” problems: improper handling of harmful gases and heavy metal wastewater generated during dismantling and crushing processes can lead to significant legal and reputational risks. Therefore, establishing recycling systems that meet the highest environmental standards in the world and proactively subjecting them to strict local oversight are crucial to the sustainable development of CATL's business worldwide.

In the context of globalized operations, CATL's cross-border supply chain network poses unique risk challenges due to its complexity. Ensuring the stability and growth of international business requires systematic identification of these risks hidden in each link.

First, there is procurement risk . CATL's international supply chain depends on key mineral resources such as lithium, cobalt and nickel, whose geographical distribution is highly concentrated, which constitutes its most fundamental vulnerability. Political instability, sudden changes in trade policy or export restrictions in any resource-producing region can instantly cause shortages of key raw materials, directly reducing the supply of products for overseas factories. At the same time, geopolitical maneuvering and market demand together push up raw material prices, maintaining high procurement costs, seriously reducing profit margins and putting the company at a disadvantage compared to competitors in Japan and South Korea. In addition, the long international logistics chain from mines to factories is full of variable factors. Events such as ship overloading and port strikes easily lead to supplier delays. These delays propagate further down the supply chain, ultimately disrupting production commitments to international customers.

The second category includes production and operational risks. When CATL establishes production bases overseas, the production process faces significant

difficulties in acclimatization. In an unfamiliar legal and cultural environment, the threat of technology leakage is heightened. Key processes or formulations risk falling victim to employee turnover or corporate espionage, potentially undermining the company's competitive advantage. The smooth operation of overseas plants is highly dependent on potentially unstable local power supplies, the development of maintenance systems, and the need for workforce training. Disruptions at any stage of operation can lead to production shutdowns or even serious safety incidents, which can have disastrous legal and reputational consequences. In addition, maintaining production cost control and product quality consistency at levels comparable to domestic operations remains an ongoing challenge, especially in high-cost regions such as Europe.

Transportation and distribution risks are another critical issue. International transportation of batteries, classified as dangerous goods, is inherently high-risk. Choosing the wrong mode of transport or carrier, or not fully complying with strict international regulations for the transport of dangerous goods, can lead to entire shipments being delayed or rejected at ports, causing significant losses [32]. During the distribution phase, the accurate delivery of battery cells to car factories scattered across Europe requires careful coordination. Any error in delivery – whether in location, model or quantity – can directly cause a customer's production line to stop, potentially leading to massive claims. While setting up overseas warehouses helps to avoid uncertainty, it creates a complex challenge of balancing inventory levels to avoid tying up capital while ensuring uninterrupted supply.

The risks associated with product returns and recycling are another dimension of vulnerability. Reverse logistics for international business is both expensive and complex. When disputes arise over the quality of exported batteries, cross-border returns become particularly difficult to manage, involving multi-party liability assessments, complex return logistics and high costs that can easily escalate into commercial disputes that damage customer relationships. At the same time, markets such as the EU are implementing legislation that ensures producer responsibility for end-of-life batteries. However, establishing effective recycling networks abroad faces numerous obstacles, as current recycling rates for end-of-life batteries remain low. The varying condition of

returned batteries significantly affects their value for resale or reuse in the secondary environment, creating both economic and technical challenges for building a sustainable global closed-loop recycling network.

Ultimately, the risks of information transmission constitute a fundamental vulnerability. The flow of information serves as the neural network of the global supply chain; any blockage leads to a sharp decline in the overall efficiency of the system. Isolated by several layers from end markets abroad, CATL's ability to predict local policy changes and demand fluctuations is compromised. Information becomes prone to distortions and delays as it travels across time zones and cultures. Moreover, supply chain participants, including international customers and suppliers, often limit information sharing due to commercial confidentiality concerns, creating "data silos." This lack of timely and transparent flow of information prevents the company from gaining real-time situational awareness, leading to either excess inventory or insufficient production capacity, ultimately impairing its flexibility to respond to global market dynamics.

2.3 Analysis of the global electric vehicle battery market

The global electric vehicle (EV) battery market, which is the main lifeblood of the new energy vehicle industry, has undergone profound and dramatic changes over the past three years (2022-2024). During this period, due to the combination of strong macro policies, explosive end-user demand, and fierce competition between technology directions, the market has not only experienced exponential growth in installed capacity, but also a structural restructuring of its internal competitive landscape, technology routes, and supply chain ecosystem. A systematic analysis of the market during this period is fundamental to understanding the competitive landscape, strategic opportunities, and systemic risks faced by Contemporary Amperex Technology Co. Limited (CATL). This section provides a panoramic interpretation of the global electric vehicle battery market from five dimensions: market size, regional structure, competitive environment, technological evolution, and political environment, with the

aim of establishing a solid and dynamic industry foundation for further analysis of CATL's anti-crisis management strategies.

In terms of market size and growth drivers, the global electric vehicle battery market has continued its strong growth trajectory over the past three years, although the underlying drivers have changed somewhat. According to BloombergNEF (BNEF), the installed capacity of electric vehicle batteries in the world has increased from approximately 550 GWh in 2022 to approximately 750 GWh in 2023, and is projected to exceed 1,000 GWh in 2024, maintaining a compound annual growth rate (CAGR) of over 35%. This impressive growth curve is primarily due to the transition of “carbon neutrality” strategies in major global economies from commitments to implementation. In China, driven by the "dual carbon" targets, although national procurement subsidies have been gradually eliminated, the continued implementation of the "dual credit" policy and effective follow-up by local incentives have stabilized the demand base in the world's largest battery market. Meanwhile, in Europe, under the European Green Deal, increasingly stringent carbon emission standards (such as the 95g/km target) have put significant pressure on automakers to comply, which directly led to strong demand for power batteries. Of particular note is the North American market, where growth has accelerated significantly after the enactment of the Inflation Reduction Act (IRA) in 2022. By offering significant tax incentives strictly tied to where vehicles are assembled and where critical minerals and battery components are sourced, the IRA not only stimulated end-user demand, but also significantly shifted the geographic location of the global battery supply chain, bringing a huge amount of battery manufacturing capacity to North America. Thus, the market growth over these three years has moved from purely political subsidies to a new phase driven by multiple factors: regulatory requirements + market incentives + consumer acceptance. In terms of the evolution of the regional market structure, the “triangular” pattern of global demand for electric vehicle batteries has been further consolidated and adjusted somewhat during these three years. The Chinese market continued to play the role of an anchor, and its share of global demand has consistently remained stable in the range of 50% to 55%. The huge domestic market, the full support of the industrial chain and the intense local competition

have together formed the unprecedented scale and vitality of the Chinese market. Europe, as a staunch supporter of the “green” transition, has maintained a share of more than a quarter of the global market. However, concerns about the “external dependence” of its supply chain have prompted the European Union to accelerate the construction of local battery capacities and strengthen control over the entire value chain through policy instruments such as the new EU Battery Regulation.

Table 2.5.

Installed capacity of electric vehicle batteries in the world (2022-2024)			
Year	Global installed capacity (GWh)	Year-on-year growth rates	Key driving factors
2022	550	40%	Continuation of Chinese subsidies, tightening of European emission standards
2023	750	36%	Introducing the American IRA, promoting NEV in rural China
2024	988	33%	Accelerating global electrification goals, reducing battery costs

Source: [52]

The most striking change has been in the North American market, where global share has rapidly increased from 12% in 2022 to around 16% in 2024, almost a direct reflection of the political influence of the IRA. The “walled market” created by this law has made access to the local North American supply chain the new benchmark for measuring a battery company’s global competitiveness. This shift in regional structure means that battery companies must evolve from a globalized strategy to a “regional deep cultivation” strategy, building local operational capabilities in all three major markets—North America, Europe, and China—to cope with their different political environments and market demands.

Table 2.6.

Share of installed capacity of electric vehicle batteries in the world by major regions (2022-2024)

Region	2022	2023	2024
China	54%	53%	52%

Region	2022	2023	2024
Europe	25%	26%	27%
North America	12%	14%	16%
Others	9%	7%	5%

Source: [52]

In terms of the competitive environment, market concentration remained high, with top-tier companies remaining relatively stable, but there were significant changes in their internal rankings and strategic orientations. CATL, leveraging its strong R&D capabilities, significant economies of scale and promising global capacity structure, has ranked first in the world for three consecutive years, with a stable market share of about 37%, demonstrating strong market dominance. Its success is due not only to its absolute advantage in the domestic market, but also to its successful expansion into overseas markets such as Europe, establishing deep partnerships with international leading automakers such as BMW, Mercedes-Benz and Volkswagen. LG Energy Solution, representing South Korean companies, has focused its market strategy on establishing joint ventures with global automotive giants (e.g. GM, Hyundai), in particular, following the IRA policy in North America. However, its overall market share has declined slightly due to strong competition from CATL and BYD. BYD's growth has been one of the most important variables in market competition over the past three years. Relying on its vertically integrated model and explosive growth in the terminal electric vehicle market, BYD's battery business, which supplies both its own vehicles and external customers, has been developing at the same time. Its market share has rapidly increased from 13.8% in 2022 to about 16.5% in 2024, competing with LG Energy Solution for the second place in the world and significantly affecting the market structure. Panasonic, which is heavily dependent on its key customer Tesla, has experienced fluctuations in its market share under the influence of Tesla's global sales rhythm and the progress of mass production of its own 4680 batteries. This competitive situation shows that technological or cost advantages alone are no longer enough to secure market position; future competition will be a comprehensive competition involving technology roadmap, capacity allocation, customer structure and supply chain

resilience.

The evolution of technology paths has been another major theme of market development over the past three years, characterized by a clear coexistence of “Lithium Iron Phosphate (LFP) comeback” and “diversified exploration”. Recently, nickel-cobalt-manganese (NCM)-based lithium-ion batteries, especially NCM 811, known for its high energy density, have been the preferred choice for premium models.

Table 2.7 .

Share of major battery manufacturers in the global market (2022-2024)

Enterprise	Market share in 2022	Market share in 2023	Market share in 2024
CATL	37.0%	37.4%	37.0%
LG Energy Solution	14.5%	14.0%	13.8%
BYD	13.8%	16.0%	16.5%
Panasonic	10.0%	9.0%	8.8%
SK Enabled	6.5%	6.0%	6.2%
Others	18.2%	17.6%	17.7%

Source: [52]

However, due to cost pressure caused by volatile prices of metals such as cobalt and nickel, as well as the industry’s increasing emphasis on battery safety, lithium iron phosphate (LFP) batteries have experienced a strong comeback, leveraging their advantages of lower cost, longer cycle life, and higher thermal stability. Their global market share has grown from 35% in 2022 to around 45% in 2024, becoming mainstream not only in entry-level and mid-range models, but also penetrating some premium segments, as evidenced by their widespread adoption in standard versions of Tesla Model 3 and Model Y. This shift has forced all battery manufacturers to adjust their technology strategies, and even players that have long focused on NCM, such as LG Energy Solution and Panasonic have announced the development or production of LFP batteries. At the same time, research into next-generation battery technologies has been unprecedentedly active. Sodium-ion (Na-ion) batteries, which serve as a strategic

hedge against potential lithium supply bottlenecks, began to move from laboratory to small-scale commercial applications between 2023 and 2024, initially finding use in sectors less sensitive to energy density, such as energy storage and two-wheeled vehicles. All- solid-state batteries, widely recognized as the best form of next-generation energy storage, have repeatedly faced delays in mass production, which is generally expected after 2028, due to unresolved key technical issues such as conductivity and stability of the solid-state interface. This means that for the next few years, LFP and NCM batteries will remain the absolute mainstream, but the innovation race is already underway in more advanced industries.

Table 2.8

Share of global electric vehicle battery technology routes (2022-2024)

Technological route	2022	2023	2024
LFP	35%	40%	45%
NCM	60%	55%	50%
Others	5%	5%	5%

Source: [52]

Finally, in terms of supply chain policy and environment, the past three years have been a period of regulatory change and risk exposure. Major global markets have introduced regulations aimed at controlling the dominance of the industrial chain and ensuring environmental responsibility. The new EU Battery Regulation is the most typical representative, setting for the first time comprehensive life cycle requirements on battery carbon footprint , use of recycled content and due diligence, setting a high “green threshold” for battery products entering the European market. The US Inflation Reduction Act (IRA), on the other hand, focuses on “localization” and “de-risking” the supply chain, trying to build an electric vehicle supply chain excluding China through tax breaks and local content requirements. This policy has significantly increased the compliance costs and complexity of global operations for battery companies. On the other hand, the fragility of the supply chain has been revealed during this period. Prices of key battery raw materials such as lithium, cobalt and nickel have experienced volatile fluctuations over the past three years. For example, battery-grade lithium carbonate, its

price fell sharply from historical highs in early 2022, but later rebounded due to tight supply and demand dynamics and market expectations. Such extreme price fluctuations have created ongoing challenges for battery manufacturers to control costs and profitability, which has also highlighted the importance of resource security for mid-range manufacturers. Geopolitical conflicts (e.g. the Red Sea crisis) have periodically impacted global logistics routes, leading to sharp increases in transportation costs and increased delivery times, testing the resilience of corporate supply chains.

In summary, the global electric vehicle battery market has been a dynamic arena over the past three years, characterized by continuous differentiation amid high-speed growth and profound policy-led restructuring. For the subject of this study, CATL, this market context provides both huge opportunities and serious challenges. Its leading share in the global market demonstrates its comprehensive strength, but pressure from competitors such as BYD, the evolution of technology routes, barriers created by European and North American local policies, and price risks of supplied raw materials together constitute the crises and pressures it has to face. Therefore, a series of anti-crisis management strategies adopted by CATL during this period, whether they are focused on supplied resources, deploying global capacities, or relying on diversified technology routes, can be seen as strategic responses to this complex and changing market environment. The following sections will examine how CATL has built and improved its crisis management system in this market full of opportunities and challenges.

SECTION 3. WAYS TO IMPROVE THE CATL ANTICRISIS MANAGEMENT SYSTEM

3.1 Promising anticrisis management measures

Insufficient data integration and analytical capabilities. CATL lacks a systematic risk early warning mechanism and has not established a unified management of multi-dimensional data, including raw material prices, production safety, and market demand. This leads to fragmented risk signals and response delays. Due to slow data updates, critical indicators such as logistics delays and raw material price fluctuations are often not reflected in the system in time, further prolonging the response time. In addition, early warning indicators are not accurate [33]. Existing indicators and warning models mainly rely on historical data, without the ability to dynamically adjust to complex external environments. The system's over-reliance on internal data and insufficient integration of external data such as weather conditions and policy changes limit its effectiveness. For example, it cannot adequately predict logistical disruptions caused by extreme weather conditions or accurately assess the potential impact of geopolitical conflicts on the supply chain.

Delayed digital transformation and information barriers. Over 80% of enterprises operate with minimal or no digital infrastructure, leading to siloed data storage and poor inter-departmental coordination. CATL's global supply chain data remains fragmented across business units and regions, creating serious information barriers. The lack of seamless data flow across regions and departments hinders the formation of a unified early warning mechanism, significantly reducing the overall effectiveness of risk alerts.

Early warning models do not sufficiently incorporate artificial intelligence and machine learning technologies, resulting in limited predictive capabilities. The existing warning system mainly focuses on upstream raw material supply and downstream market demand in the supply chain, while monitoring of intermediate production and logistics links remains relatively weak, making it easy to ignore potential risks. Crisis response strategies tend to be reactive, with insufficient reserves of experience.

Passive crisis response and insufficient knowledge retention . Crisis measures mainly rely on the optimization of internal resources, lack flexible allocation of external

resources and the development of rapid response teams. Only 33.6% of enterprises have significant experience in crisis management, while 26% do not have relevant experience, which further weakens crisis management capabilities. The mechanism for summarizing crisis experience is underdeveloped, with 49.8% of enterprises rarely or never conducting post-crisis reviews, leading to a serious loss of institutional knowledge.

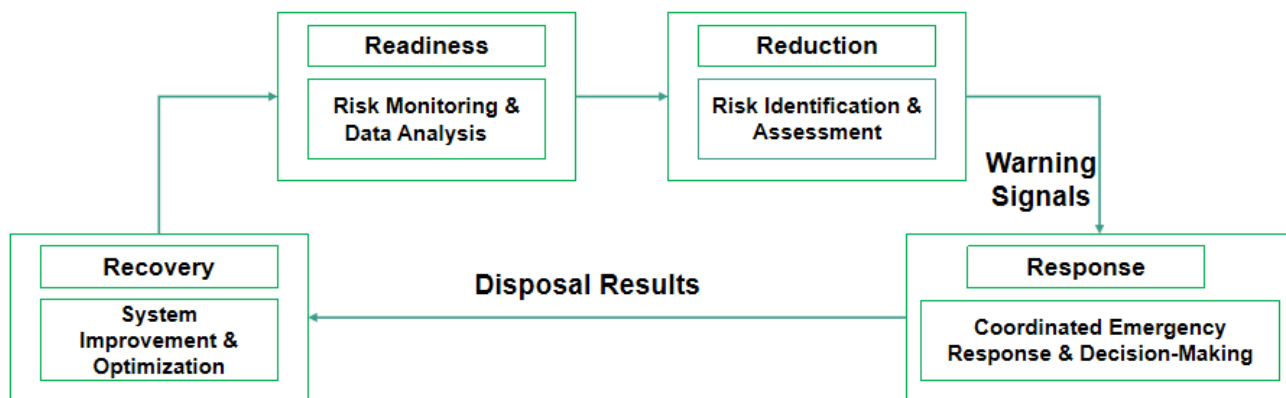


Fig. 3.1. Architecture diagram of CATL's intelligent supply chain early warning and risk response system.

Source: developed by the author based on [41]

The globalization of CATL's business creates significant challenges for supply chains. As supply chains span multiple countries and regions, management challenges and risks are compounded. A suboptimal supplier structure further weakens risk resilience capabilities.

Structural weaknesses in supply chain architecture . Micro and small enterprises make up 78.7% of CATL's supplier base, demonstrating limited resilience to risks and high vulnerability to disruptions. Primary suppliers account for only 10.6%, while over-reliance on secondary suppliers creates complex, multi-tiered supply chains that concentrate risk at the raw material level. This structural imbalance is reflected in critical weaknesses: 41.3% of suppliers demonstrate poor resilience to stress, 51.2% require 1-6 months to return to normal operations, and the overall system lacks diversification in both supply sources and manufacturing locations. The lack of rapid response mechanisms and effective contingency planning further exacerbates the vulnerability of

the supply chain during crises. Of particular concern is the dependence on a single supplier for critical components and raw materials, which creates potential points of paralysis when supplier issues arise.

Insufficient response and recovery capabilities . Inventory shortages pose serious challenges, with 44.3% of enterprises facing significant inventory pressure. CATL's emergency inventory levels may not be sufficient to withstand short-term supply disruptions, potentially severely impacting production and supply capacity. Early warning systems for critical raw material supply risks remain underdeveloped, and price volatility is the most serious source of risk, affecting 65.1% of enterprises. The September 2024 production shutdown at CATL's key lithium supplier in Jiangxi exposed this vulnerability, forcing emergency production adjustments despite the company's commitment to optimize the supply chain. The incident revealed insufficient risk diversification in supply chain planning, which exacerbated cost pressures amid volatile lithium prices. The company's inventory management and procurement strategies proved ineffective in hedging the sharp price fluctuations of lithium, cobalt and nickel during 2021-2024. The 4.5 billion yuan inventory drawdown in 2023 demonstrated the inability of early price warning mechanisms to predict market turning points.

Delay in responding to external environmental risks . CATL's supply chain architecture demonstrates insufficient elasticity and buffer capacity to dynamically respond to market fluctuations or sudden risk events. The inability to quickly switch to alternative suppliers or adjust production bases, combined with the geographical concentration of key production facilities , systematically exacerbates risks and operational instability. The lack of assessment of geopolitical risks was highlighted in June 2024, when US allegations of forced labor in CATL's supply chain, although immediately denied, revealed insufficient monitoring of international political risks and passive response mechanisms, which damaged the brand's reputation. Logistics disruptions have a profound impact on operations, with 54.8% of businesses reporting a significant impact, highlighting the urgent need for logistics resilience. International expansion remains underdeveloped, with only 10.6% of supply chain businesses

achieving a global presence, while 66.8% remain focused on the domestic market, creating a strategic mismatch with policy risks.

Ineffective inter-regional and inter-enterprise coordination , persistent information silos . CATL's globally distributed supply chain operations suffer from inadequate mechanisms for information exchange between regions and enterprises. For example, delays and inaccuracies in communication between logistics and production departments often occur.

The lack of standardized processes and protocols for interregional and intercorporate cooperation reduces the efficiency of information transfer and decision-making. Complex coordination challenges, cultural differences, language barriers, and time zone variations make it difficult to coordinate efforts in international supply chain operations. Insufficient digital collaboration platforms.

The lack of integrated communication and decision-making platforms creates a dual problem: reduced inter-organizational synergy and reduced responsiveness. Transparency and coordination management remains critically underdeveloped: 76.2% of enterprises do not implement any improvement measures, only 2.6% participate in ESG ratings and do not implement advanced technologies such as blockchain .

Overall financial condition assessment - the result obtained: Z- Score = 3.34. CATL is in the "Green Zone" ($Z > 2.99$), which indicates high financial stability and minimal risk of bankruptcy over the next 1-2 years.

For investors, CATL is a financially stable investment, but 63% of the protection against bankruptcy is provided by a high stock market valuation. It is recommended to monitor stock volatility and diversify your portfolio.

For lenders: The company demonstrates excellent creditworthiness with low default risk. The debt-to-market ratio (3.5) is a comfortable buffer.

For management: Despite the high Z- Score , it is necessary to focus on increasing operating profitability (X_3) and asset turnover (X_5) to reduce dependence on market revaluation.

CATL remains a financially stable leader in the global battery industry with minimal bankruptcy risk, supported by both operational success and exceptionally high

investor confidence.

3.2 Recommendations for future crisis management

Creating a global system for supply chain sustainability . In the context of the restructuring of global supply chain structures, CATL must develop a highly resilient global supply chain structure. The essence of this system is to create a multi-layered safety net that can quickly respond to geopolitical risks, market fluctuations and supply chain disruptions through organizational transformation, technological capabilities and ecosystem cooperation.

At the organizational level, it is recommended to implement a three-tier supply chain situation room system. Studying Samsung 's emergency response experience Electronics during the tsunami in Japan, CATL should establish a global supply chain command center at the headquarters level, integrating global supplier databases with risk mapping to develop monitoring mechanisms covering public opinion tracking, geopolitical risk assessment, and logistics route security. For example, when faced with shipping crises in the Red Sea, the headquarters situation room can activate alternative transportation solutions within 48 hours by monitoring real-time shipping data. At the regional level, establishing situation rooms in key markets such as Europe and Southeast Asia, equipped with dynamic simulation platforms, will allow regular stress testing of region-specific risks. For example, an Indonesian plant could develop capacity allocation plans between plants in advance by simulating how local political instability might affect nickel supplies. At the operational level, requiring Tier 1 suppliers to install Internet of Things (IoT) terminals and standardized emergency manuals in their warehouses will ensure that frontline personnel can initiate emergency response procedures within 10 minutes of a breach.

Technological empowerment involves the deep integration of digital twin and blockchain technologies . Embedding digital twin models in the supply chain system allows for real-time monitoring of equipment status across global production bases and the efficiency of logistics routes. This technology can simulate the risks of equipment aging in a German factory, proactively triggering maintenance alerts to prevent

production downtime. For compliance management, blockchain technology establishes raw material tracking systems that meticulously record complete process data from cobalt mining in the DRC to final products, effectively fulfilling the traceability requirements of the EU's New Battery Regulation and the US UFLPA. Leveraging blockchain's immutability, each exported battery will have a unique digital identification containing production batch information and carbon footprint data, which will enhance the trust of international customers.

In terms of ecosystem synergy, the establishment of a distributed supply chain alliance is the final component. Building on CATL's dominant position in global battery markets, the company can bring together mining and processing partners on a supply chain collaboration platform. Following the technology licensing cooperation with Ford, CATL can expand deep cooperation with international automakers such as Stellantis, establishing joint production bases in Europe to form capacity mutual assistance mechanisms. Smart contracts will enable automatic capacity allocation among alliance members, automatically activating reserve capacity when geopolitical crises cause regional supply disruptions. At the same time, leading the establishment of unified compliance standards and a supply chain "whitelist" system will mitigate the risks associated with a single supplier.

Faced with an increasingly complex international political and economic environment, CATL must deepen its dual-circulation strategy of "global production, global sales" while reducing systemic risks through regionalized deployment.

In terms of dual market positioning, implementing differentiated regional strategies is crucial. In developed markets such as Europe and North America, the focus should be on localized operations, with fully integrated manufacturing bases in Germany and Hungary, deeply integrated into local industrial chains. These facilities should not only produce cells, but also establish local R&D centers that develop low-carbon battery products adapted to Europe's strict carbon footprint requirements. For the North American market, flexible approaches such as technology licensing allow for maintaining a market presence while taking into account current political sensitivities. In emerging markets in Southeast Asia and South America, low-capital operation models

that leverage technology transfer and supply chain services can expand their reach.

The dual-circulation technology approach requires building a multi-level technology export system. Domestic bases should focus on cutting-edge research such as sulfide solid-state batteries to maintain technological leadership. Overseas production facilities will optimize the production costs and performance of mature technologies such as LFP and ternary lithium batteries. This cycle of “profit from mature technologies – position for cutting-edge technologies” ensures current market competitiveness while accumulating momentum for future technological iterations. For example, second-generation LFP battery technology can be licensed to overseas joint ventures in exchange for market access and resource support.

For the dual circulation of resources, promoting global resource sharing forms the final strategic level. While deepening cooperation with traditional resource partners such as Australia and Chile through long-term agreements and equity investments provides high-quality resources, the active development of new resource channels remains equally important. Exploring innovative “technology-for-resource” models in African regions such as the DRC and Namibia can lead to the exchange of relatively mature technology patents for mineral resource extraction agreements. Meanwhile, supporting relevant domestic lithium mica mining capacities provides strategic support for resource supply security.

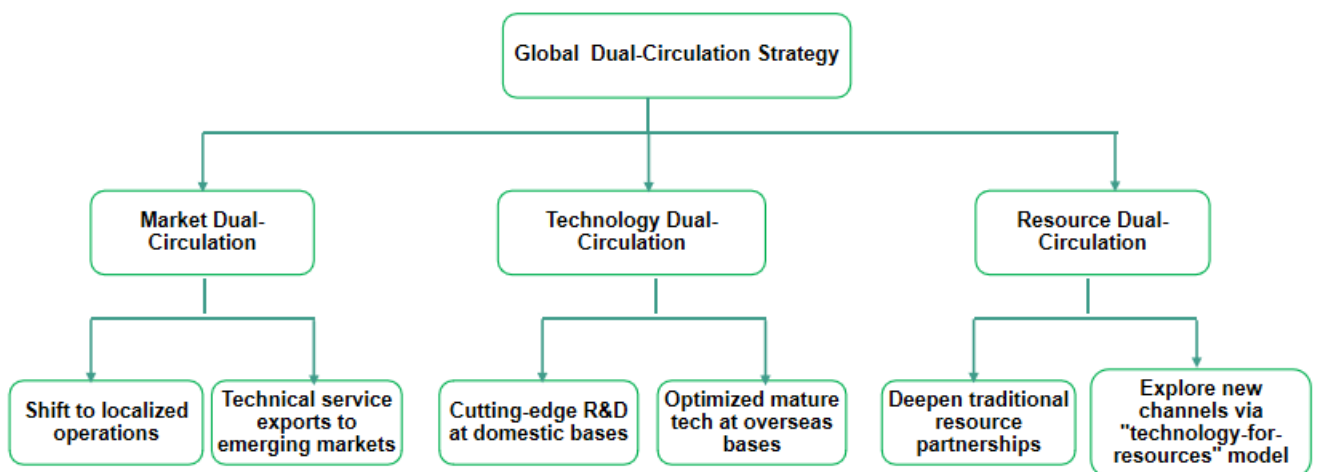


Fig . 3.2. Implementation framework for CATL's global dual-circulation strategy

Source: developed by the author

Developing an intelligent compliance and risk control system . As global regulatory oversight of the battery industry increases, establishing an intelligent compliance and risk control system has become essential to safeguard CATL's international operations.

The first priority is to create a dynamic compliance database that systematically aggregates regulatory requirements from key global markets. This database should comprehensively cover key requirements, including carbon footprint and recycled content factors under the EU's New Battery Regulation , local content rules under the US Inflation Reduction Act, and conflict minerals traceability requirements across jurisdictions. By leveraging machine learning, the system can track regulatory changes in real time and automatically assess their potential impact on the supply chain. For example, when updates to the EU's carbon footprint methodology are detected, the system will automatically recalibrate the carbon footprint models of relevant products and flag any manufacturing processes that need to be adjusted.

The second initiative focuses on creating detailed supplier compliance profiles through multidimensional assessment of global suppliers. This involves developing a supplier risk assessment system that integrates metrics covering ESG performance, geopolitical impact and financial stability. The system will automatically flag high-risk suppliers, leading to requirements for on-site audits or additional documentation for verification. In particular, for cobalt suppliers, the platform will periodically require updated conflict-free mineral reports using blockchain technology to verify the authenticity of this data.

The third component involves the development of intelligent compliance tools to improve management efficiency. This includes the creation of automated carbon footprint calculation systems that directly interact with energy consumption data from the global production base and information on raw material procurement. These systems will calculate the carbon footprint of products in real time and automatically generate fully compliant battery passports for the EU market. At the same time, the implementation of an early warning mechanism for risks associated with non-

compliance will ensure that in the event of an escalation of political risks in the supplier country, the system automatically notifies procurement departments of the need to initiate procedures to develop a backup supplier.

Table 3.1

Main functions and applications of CATL's intelligent compliance and risk control system

Compliance problem	Basic technical tool	Main functions and processes	Results and applications
New EU regulation on batteries (carbon footprint, recycled materials)	Automated carbon footprint calculation system	<ol style="list-style-type: none"> 1. Integrates energy consumption and purchasing data from global databases 2. Calculates the product's carbon footprint throughout its entire life cycle in real time 3. Automatically generates the corresponding "Battery Passport" 	Meets EU market access requirements, builds an ecological brand image
US UFLPA (Forced Labor Law)	Blockchain tracking system	<ol style="list-style-type: none"> 1. Records the full chain of data from mining to finished product 2. Uses immutability to ensure the authenticity of evidence 3. Provides a query interface for customers and regulators 	Provides confirmation of compliance, reduces trading risks, increases customer trust

Compliance problem	Basic technical tool	Main functions and processes	Results and applications
Dynamic changes in regulatory bodies in many countries	Dynamic matching database and machine learning	<ol style="list-style-type: none"> 1. Tracks global regulatory changes in real time 2. Automatically assesses supply chain impact 3. Displays warnings and suggests alternative solutions 	Allows you to move from reactive to proactive management, reduces the risk of fines for non-compliance

Source [41, 52]

Optimizing the sustainability of the global logistics network. The security and stability of international logistics corridors are of direct importance to the smooth operation of CATL's global supply chain, requiring a multi-level, multi-channel logistics protection system.

Diversification of logistics corridors is important to reduce dependence on individual routes. While maintaining traditional shipping routes, CATL is actively developing alternative solutions such as the China-Europe Railway Express and cross-border road transportation. For example, during the Red Sea crisis, the company quickly activated the China-Europe Railway Express as a backup option. Although this increased the cost of one container by about US\$1,000, it ensured that delivery schedules for customers were met. At the same time, the establishment of regional distribution centers in key logistics hubs such as the Asia-Pacific Hub in Singapore and the European Center in the Netherlands creates an efficient "mainline + hub" logistics network.

Development of a digital logistics platform provides global logistics transparency. The use of Internet of Things technology allows for real-time monitoring of cargo in transit, providing early warnings of potential delays. The logistics risk map can dynamically display information such as the status of major global shipping routes, port congestion levels, and weather conditions. When anomalies are detected on a particular

route, the system automatically recommends the best option and calculates the associated switching costs and time implications.

Establishing emergency logistics mechanisms involves creating multi-level response plans. Detailed emergency operating instructions should be developed for different levels of supply chain disruption. In the event of minor delays, expedited transportation processes can be initiated; in the event of major disruptions, backup transportation options and stockpiles are immediately activated. Regular logistics emergency drills ensure that all personnel are familiar with response procedures.

Strengthening post-crisis recovery mechanisms. The ability to recover quickly from a supply chain crisis is a key indicator of corporate supply chain management competency, requiring systematic recovery mechanisms.

Implementation of a business impact assessment system allows you to scientifically determine recovery priorities. By quantifying the impact of disruptions on customers, revenue, and brand reputation for different business lines, you can clearly determine the sequence of recovery of critical operations. For example, priority will be given to restoring product supply to strategic customers, then to regular customers, and finally to the spare parts market. You should also create a mechanism to evaluate the effectiveness of recovery to continuously optimize recovery plans.

Building a supply chain financial support system provides a crucial guarantee of financing for recovery efforts. Working with global financial institutions to provide supply chain backup lending ensures rapid access to capital during major crises. For example, after a major natural disaster that halts production, emergency financing can be activated immediately to support recovery and reconstruction.

Creating a knowledge management system contributes to continuous improvement in risk resilience. Systematically documenting the process of occurrence, response, and evaluation of the effectiveness of each crisis creates a valuable library of cases. Regular reviews help identify systemic weaknesses and drive continuous improvement. In addition, establishing supply chain resilience metrics and incorporating resilience improvements into departmental performance assessments encourages company-wide participation in improving supply chain reliability.

Through the systematic development of these five areas, CATL will build a global supply chain system equipped with early warning, countermeasure, adaptation and recovery capabilities, providing a solid foundation for the sustainable development of its international business. This system will not only effectively counter current geopolitical risks and supply chain challenges, but also lay a solid foundation for the company's long-term competitiveness in the global market.

3.3 . Current crises and measures to overcome them in CATL's international business .

CATL faces four categories of crises in its global operations, dominated by systemic geopolitical risks and compliance issues. Rising trade protectionism and regulatory pressure from the US have forced the company to undertake a comprehensive restructuring of its supply chains and limit strategic expansion in North America.

In parallel, increasing international requirements, in particular the new EU regulation on batteries, necessitate environmental modernization of production and significant financial costs. The situation is complicated by logistical disruptions due to geopolitical conflicts, which significantly increase the time and cost of transit. An additional challenge is the volatility of prices for critical raw materials and increased state control over resources, which requires a transition from market mechanisms to more sustainable supply security management strategies. Among the notable incidents is the unprecedented compression of positions in the nickel market on the London Metal Exchange (LME) in March 2022, when prices soared from \$29,000 to \$100,000 per tonne in one day. CATL, which was mass-producing high-nickel ternary batteries NCM811 at the time, suffered a 15% increase in raw material procurement costs that month, leading to a 5 percentage point decline in battery gross margin from the previous quarter in the first quarter of 2022. This crisis was exacerbated by the ban on cobalt exports imposed by the Democratic Republic of Congo in February 2025, which caused a 50% increase in global prices within two months, forcing CATL to resort to expensive spot procurement , which added nearly 200 million yuan to its monthly cobalt

procurement costs. In addition, lithium prices experienced sharp volatility between 2021 and 2024, with the price of battery-grade lithium carbonate increasing from 53,000 yuan/ton at the beginning of 2021 to 254,000 yuan/ton by the end of the year – a 379% increase that directly contributed to the company's gross margin shrinking from 27.8% in 2020 to 22.0% in 2021.

Supply chain resilience deficiencies are the third critical vulnerability. The global structure of a company's supply chain demonstrates excessive dependence on individual suppliers and logistics routes, which has been repeatedly revealed during various crises. In the context of global value chain restructuring, supply chain resilience and resilience to shocks have become key components of corporate competitiveness. However, supply chain structures, historically optimized for efficiency and cost, often prove fragile when faced with systemic risks. This vulnerability arises not only from external uncertainties, but also from insufficient attention to risk prevention in internal management. The rapid expansion of global operations has created a growing mismatch between the growing complexity of the supply chain and the risk management capabilities of the company, constantly expanding the company's risks.

Documented cases show that when a lithium mine in Jiangxi suspended production for environmental rehabilitation in early 2024, CATL faced an immediate shortage of lithium carbonate for its battery production lines. Internal data shows that the raw material shortage reduced the overall utilization of the production line by about 7% in the first quarter of 2024. The delivery delays triggered a 90% increase in customer complaints compared to the previous quarter, and some key customers began to look for alternative battery suppliers. At the same time, the ongoing Red Sea crisis forced European cargoes to be rerouted via the Cape of Good Hope, which increased shipping times by 15 days and sharply increased from 3,000 to 7,000 US dollars per container. These incidents clearly exposed the shortcomings of the company's supply chain resilience and highlighted the urgency of creating diversified, flexible supply chain systems.

Internal coordination and information management constitute the fourth major challenge. As businesses continue to grow in scale, information barriers between

departments become increasingly apparent, becoming a critical bottleneck that limits global operational efficiency. Effective internal coordination and information sharing provide fundamental capabilities for navigating complex international environments in the era of corporate globalization. However, increasingly complex organizational structures, dispersed business units, and fragmented information systems often lead to inefficient decision-making and misallocation of resources. Especially in a rapidly changing market, delays and distortions in information transmission can amplify the impact of external risks, leading to missed opportunities for timely response. Such internal coordination barriers not only impair operational efficiency but also potentially undermine a company's overall competitiveness.

A case in point was the first half of 2024, when the sales department predicted a 200% increase in demand for a new battery model, while the production department, based on historical trends, prepared only 50% of the required capacity. The actual market demand increased by 150%, creating a serious product shortage that missed the market opportunity of about 1.5 billion yuan. Meanwhile, traditional battery models became overloaded due to forecasting errors, tying up capital of more than 800 million yuan. Even more seriously, the disconnected CRM and IMS systems did not allow the supply chain department to access real-time inventory data in the warehouse, leading to situations where urgent orders from the same customer remained unfulfilled and identical products were idle for more than 90 days in other warehouses. These problems clearly reveal shortcomings in the company's internal coordination mechanisms and highlight the critical importance of advancing digital transformation to eliminate information barriers.

In the Chinese domestic market, which accounts for more than three-quarters of CATL's total business, the company controls 43% of installed capacity in new electric vehicles. [45] However, the main factor limiting CATL's growth in the domestic market is the rapid growth of BYD, which produces its own batteries, and the emergence of new smaller suppliers such as CALB and Sunwoda [46].

Table 3.2.

Dynamics of key indicators of CATL's export strategy

Indicator	Value	Comment
Share of foreign income (2020)	15.72%	Initial export level
Share of foreign income (2023)	32.67%	Peak export revenues
Share of foreign income (2024)	30.48%	Decrease due to price competition
Global Market Share (2024)	37.9%	The undisputed world leader
Market share in Europe (2021)	17%	A modest presence
Market share in Europe (2024)	38%	2.2 times growth in 3 years
Number of factories abroad	8	Germany, Hungary, Spain, Indonesia, Thailand + USA (partnerships)
Total capacity in Europe	164 GWh	GWh plant in Hungary
Investments in Europe	€11+ billion	Majority of shares from Hong Kong IPO (\$5.2 billion)
Number of partnerships (automakers)	18	Europe (6), China (5), Asia (4), North America (3)

Source: [40, 45].

CATL maintains a dominant position in the global electric vehicle battery market . According to SNE Research , the company retained its position as the world's largest manufacturer in 2024 with a market share of 37.9%, up from 36.6% in 2023. In January-November 2024, CATL's battery installations amounted to 289.3 GWh , up 28.6% from 225.0 GWh in the same period in 2023 [44].

The closest competitor BYD is in second place with a market share of 23.1% in 2024, and third place belongs to LG Energy Solution with 12.7%. It is important to note that CATL remains the only battery manufacturer in the world with a market share of over 30%. [40]

SWOT analysis of CATL's export strategy , Strengths:

Technological leadership. CATL holds over 43,000 global patents and has made significant technological breakthroughs in LFP batteries , including the second-generation Shenxing battery , which can add 520 km of range in five minutes of charging with a peak charging power of 1.3 megawatts. The company has also developed lithium metal batteries (LMBs) with energy densities exceeding 500 Wh /kg [40], [41].

Production scale. CATL controls approximately 40% of global battery production capacity in 2024 and supplies batteries for one in three electric vehicles sold worldwide. At the end of 2021, the company had an annual production capacity of 170.39 GWh , with an additional 140 GWh under development, with the goal of achieving a total annual capacity of 670 GWh by 2025 [42].

Diversified cooperation models. CATL has successfully implemented four different cooperation models: direct battery supply (14 agreements), joint ventures (JV), technology licensing (LRS), and ecosystem cooperation (Choco-Swap). This flexibility allows it to adapt to different regulatory environments and customer needs. [51].

Strong patent base. A portfolio of 43,000+ patents provides CATL with technological advantage and the ability to monetize intellectual property through the LRS model [44].

Features: Growth of the electric vehicle market in Europe. The European market is actively transitioning to electric vehicles, creating significant demand for local battery suppliers . This opens up opportunities for further growth of CATL's market share in the region [2 6] .

Choco-Swap Ecosystem . Battery swap innovation has the potential to expand beyond China to Hong Kong, Macau, and ASEAN countries, creating a new recurring revenue stream from the service ecosystem [38].

LRS model for the USA. The technology licensing model allows CATL to bypass IRA restrictions and access the US market with minimal capital investment and risk, while helping partners obtain government subsidies [47].

Weaknesses:

Dependence on the Chinese market. Despite growing exports, 69.52% of CATL's revenue is still generated in the domestic Chinese market, creating concentration risk

[48] .

High capital investment. Building your own factories requires significant investments: \$7.6 billion for Hungary, \$4.1 billion for Spain, which creates financial risks in the event of a slowdown in demand for electric vehicles [49].

Threats:

Geopolitical risks. The inclusion of CATL on the US Department of Defense's list of companies associated with the Chinese military creates reputational risks and may complicate cooperation with American partners, despite the company's denials [50].

Trade barriers. The European Union has imposed punitive tariffs on Chinese electric vehicles, and IRA restrictions in the United States are creating obstacles to direct investment. Additionally, in July 2025, China tightened export controls on key lithium battery manufacturing technologies , which could complicate technology transfer [46].

Increasing competition. BYD and LG Energy Solution are actively strengthening their positions. In addition, new small suppliers are appearing on the domestic Chinese market, which is intensifying price competition. [44] .

CATL's countermeasures focus on four strategic areas. The company is improving its global localization strategy to systematically hedge geopolitical risks, accelerating the build-up of overseas capacities to drive the strategic transition from “Made in China, sold globally ” to “Made globally , sold globally ”. This transformation aims not only to bypass trade barriers, but also to achieve deep integration into regional markets and build a more reliable global supply chain network. The establishment of localized production bases in major global markets allows for a better understanding of local demand, rapid response to policy changes, and reduced impact of risks from one region on overall operations. Implementing this global localization strategy requires cross-cultural management skills, global operational experience, and awareness of local innovations, which is a comprehensive test of the company’s overall capabilities.

Specific implementations include the pioneering implementation of an advanced carbon footprint tracking system during the construction of the Hungarian plant to meet the requirements of the New EU Battery Regulation, which allows monitoring of carbon emission data throughout the entire process, from raw material procurement to

production. At the same time, the company invested 1.2 billion yuan to establish a research and development center in Germany specifically dedicated to developing next-generation low-carbon batteries that meet EU requirements. By the end of 2024, through the introduction of renewable energy and optimization of the production process, the German plant has reduced the carbon footprint of its batteries by 30% compared to the domestic level, laying a solid foundation for achieving the 2030 goals. In addition, the company has strengthened its global compliance team, developing specialized analysis and response mechanisms adapted to the complex regulations in different countries, to ensure that all operations worldwide comply with local legal requirements.

Strengthening control over mining resources and technological substitution is the second strategic countermeasure. To effectively counter the volatility of raw material prices, the company is building a stable cost structure through several parallel approaches. This strategy focuses on creating long-term mechanisms to counteract fluctuations in resource prices through vertical integration, technological innovation, and supply chain coordination. In the face of intensifying global competition for critical mineral resources, strengthening control and influence over mining resources is not only related to cost competitiveness, but also, above all, to the security and stability of supply chains. At the same time, reducing dependence on scarce resources through technological innovation, developing alternative materials, and optimizing material efficiency provides a fundamental path to address the problem of resource constraints. This multi-dimensional response strategy reflects the company's strategic evolution from passive reaction to proactive planning.

Specific actions include signing a five-year long-term purchase agreement with an Australian lithium producer in 2023, ensuring annual supplies of 20,000 tonnes spodumene concentrate with quarterly price adjustments, effectively reducing the risks of market price fluctuations. In terms of technological substitution, the company has accelerated the industrialization of sodium-ion batteries, achieving a production capacity of 5 GWh by 2024, which has been successfully applied in electric two-wheeled vehicles and energy storage systems, reducing dependence on lithium resources. In addition, continuous technological innovation has reduced the cobalt content of ternary batteries

from the original 33% to the current below 10%, which greatly mitigates the impact of cobalt price volatility . The company has also established an early warning mechanism for raw material price risks and uses financial instruments such as futures hedging to manage short-term price fluctuation risks.

Building a diversified, flexible global supply chain network is the third strategic direction. To comprehensively improve the resilience of the system, the company is systematically optimizing its supply chain architecture. These efforts focus on overcoming excessive dependence on individual suppliers, individual regions, and individual transportation routes by creating a multi-tier, multi-regional backup supply chain system. In the context of global supply chain restructuring, such a diversified deployment not only spreads risks but also strengthens the company's bargaining power. At the same time, creating a flexible supply chain system allows for rapid response to market changes and ensures rapid switching and recovery of supply chains during crises. Although these investments increase short-term costs, they are necessary costs to ensure long-term business continuity.

Representative measures include the emergency activation of a diversified supply solution after the suspension of lithium mining in Jiangxi Province in 2024, the supply of lithium resources from Sichuan, Qinghai and other local regions, and the increase in imports from Australia and Chile to restore normal production levels within two months through multi-source supply. To address logistics risks, the company has established strategic partnerships with several logistics service providers, including COSCO Shipping and Maersk , promptly adjusted delivery routes during the Red Sea crisis, and for the first time used China-Europe Railway Express for urgent orders on a large scale. Although this increased the cost of a container by about US\$1,000, it ensured the delivery time of customers and protected the business reputation. The company has also developed a supply chain risk map that allows real-time monitoring and assessment of potential risks across different regions of the world, facilitating the advance formulation of contingency plans. These measures have significantly improved the resilience of the supply chain to risks, providing reliable protection for sustainable business development.

The fourth strategic countermeasure is a comprehensive digital collaborative transformation. In order to completely eliminate internal information barriers, the company is implementing a deep digital transformation. This transition involves not only technological upgrades, but also fundamental changes in management models and organizational culture, aimed at creating a new operating system characterized by data-driven decision-making, intelligent planning, and effective collaboration. By building a single digital platform, the enterprise can achieve visual management and optimal allocation of global resources, improving the efficiency and accuracy of decision-making. At the same time, the application of digital tools strengthens interdepartmental cooperation, breaks down information barriers, and promotes more flexible and efficient organizational work mechanisms. In the complex environment of global operations, this digital transformation is an important path to improving competitiveness.

Supply Chain Project in 2024. Chain Smart Brain ” with an investment of 500 million yuan to integrate previously isolated systems such as CRM and IMS. During the trial period of the new system, the company achieved real-time inventory visibility across its 13 global production bases and 26 large warehouses. With the implementation of AI-based forecasting models, the accuracy of demand forecasting improved by 25 percentage points in the third quarter of 2024 compared to the beginning of the year. At the same time, the company established an interdepartmental supply chain coordination mechanism, including weekly meetings between sales, production and supply chain departments, where production plans are jointly formulated based on system data, which effectively prevents the recurrence of previous problems such as shortages of new models and overstocking of old models. The company has also implemented a digital risk alert platform that enables real-time monitoring and intelligent alerts of potential risks across the global supply chain, significantly increasing proactiveness and timeliness in risk response.

CATL's export strategy to expand sales geography demonstrates a comprehensive and multi-dimensional approach to global expansion. During the period of 2020-2024, the company has made significant progress in diversifying its geographical revenue structure, increasing the share of overseas markets from 15.72% to 30.48%, which in

absolute terms means an increase in international sales from 7.91 billion to 110.34 billion yuan [3 4] .

The key elements of CATL's successful export strategy are: Europe is identified as the priority market with the largest investments (€11+ billion) and the highest market share growth rate (from 17% to 38% in 2021-2024). The strategic location of production facilities near major customers (Mercedes-Benz , BMW, Volkswagen , Stellantis) provides logistical advantages and a fast response to market needs [15].

Second, adaptive collaboration models. CATL demonstrates flexibility in choosing the forms of entry into different markets: its own factories in Europe and Asia for full control, joint ventures for risk sharing, technology licensing (LRS) to circumvent trade barriers in North America, and an ecosystem approach (Choco-Swap) to create recurring revenues [29].

Third, large-scale investments in localization. Building production facilities in key consumption regions allows CATL to avoid trade tariffs, receive support from local governments, and meet growing demands for local content in batteries [51].

Fourth, technological leadership. A portfolio of 43,000+ patents, breakthrough innovations in LFP batteries , and ongoing investments in R&D (\$2.59 billion) create competitive advantages and opportunities to monetize intellectual property through licensing [35].

At the same time, CATL's export strategy faces significant challenges. Geopolitical tensions between the US and China, trade barriers in the form of EU tariffs and IRA restrictions, China's tightening export controls on battery technology , and growing competition from BYD and LG Energy. Solution creates uncertainty for long-term growth [47] .

The decline in the share of foreign revenues from 32.67% in 2023 to 30.48% in 2024 signals potential difficulties in maintaining export growth. This decline is largely due to falling battery prices due to lower raw material costs, particularly lithium carbonate, which reduces nominal revenues even as physical sales volumes increase [4].

For the continued success of CATL's export strategy, it is advisable to:

- Accelerate the launch of European plants (Hungary in 2025, Spain in 2026) to capitalize on growing demand and increase market share.
- Expand the LRS model to European markets to reduce the capital intensity of expansion and increase flexibility.
- Accelerate the promotion of the Choco-Swap ecosystem to international markets (Hong Kong, ASEAN, possibly Europe) to differentiate from competitors and create long-term relationships with customers [39].
- Strengthen vertical integration through projects like the cathode materials plant in Morocco to ensure supply chain stability [43] .
- Diversify the geography of production outside of China to reduce geopolitical risks and improve access to local markets.

Overall, CATL's export strategy to expand its sales geography is well-structured and effective, as evidenced by the growth of its global market share to 37.9% and a dramatic increase in its presence in Europe. However, to sustain long-term growth, the company needs to continue to adapt its strategy to geopolitical realities, regulatory changes and the evolving competitive landscape of the global electric vehicle battery market. [46] .

CONCLUSIONS:

This study systematically investigates the development and implementation of crisis management strategies for export-oriented enterprises using Contemporary Ampere Technology Co., Limited (CATL) as a comprehensive case study. The study demonstrates that in today's volatile global environment characterized by geopolitical tensions, supply chain disruptions, and stringent regulatory changes, developing a proactive and resilient crisis management system is paramount to maintaining international competitiveness.

The theoretical framework laid out in the first chapter, based on the 4R crisis management model (reduce, prepare, respond, recover) and supply chain risk management theories, provides a crucial foundation for understanding organizational resilience. This theoretical perspective proves particularly valuable when examining the operational realities of CATL, where abstract concepts are translated into concrete strategic actions and operational challenges.

An analysis of CATL's current international operations reveals both significant achievements and critical vulnerabilities. While the company has successfully expanded its global footprint through strategic partnerships and localized manufacturing, it faces significant challenges in four key areas: geopolitical and compliance risks, volatility in critical material supplies, supply chain vulnerabilities, and internal coordination inefficiencies. These challenges manifest themselves in specific operational issues, including reliance on single-source suppliers, logistical bottlenecks, crisis response mechanisms, and information silos that hinder rapid decision-making.

In response to these challenges, the proposed improvement strategies outline a comprehensive path forward. The recommendations focus on building a global supply chain resilience system through organizational restructuring and technological capabilities, deepening the dual-circulation strategy to balance domestic innovation with global commercialization, creating intelligent compliance mechanisms to navigate a complex regulatory environment, optimizing logistics networks for greater flexibility, and implementing systematic post-crisis recovery protocols. Together, these measures address identified weaknesses while leveraging CATL's existing strengths in

technological innovation and market positions.

CATL's case offers valuable insights for other export-oriented enterprises facing similar challenges. It illustrates that effective crisis management requires a comprehensive approach that combines strategic foresight, organizational adaptability, technological integration, and collaborative partnerships. Rather than simply reacting to disruptions, companies must build inherent resilience into their operational DNA, enabling them to not only withstand shocks but potentially emerge stronger from crises.

Looking ahead, implementing these strategies will determine CATL's ability to transition from a "world-class company from China" to a truly "great global enterprise." More broadly, this research contributes to our understanding of how modern multinational corporations can thrive in an increasingly uncertain global business environment by systematically building and sustaining crisis-resilience capabilities across their entire organizational ecosystem.

REFERENCES:

1. Heath R. Crisis Management. CITIC Publishing House, 2011.
2. Barton, L. Organizational Crisis Management. 2nd ed. Translated by Fu Caixia. Beijing: Tsinghua University Press, 2012, 325.
3. Heath R. Crisis management for managers and executives. London: Financial Times Management, 1998.
4. Mitroff I.I. Crisis Management: A Diagnostic Guide for Improving Your Organization's Crisis-Preparedness. 1st ed. San Francisco : Jossey-Bass, 1993, 272.
5. Pearson, C. M., & Clair, J. A. (1998). An Integrative Framework for Organizational Crisis Management. *Journal of Management*, 24(4), 595-626.
6. Augustine, N. R. (2000). Managing the crisis you tried to prevent. *Harvard Business Review*, 73(6), 147–158.
7. Caponigro, J. R. (2000). The crisis counselor: A step-by-step guide to managing a business crisis. McGraw-Hill.
8. Mitroff, I. I. Managing Crises Before They Happen [M]. AMACOM, 2005.
9. Tachibana, M. Crisis Management: The Formulation and Implementation of Emergency Plans. Shanghai Translation Publishing House, 1990.
10. Coombs, W. T. Ongoing Crisis Communication: Planning, Managing, and Responding. SAGE Publications, 2008.
11. Guo, S. Q. Research on International Trade Risk Management Strategy of CS Refractory Materials Company. Chang'an University, 2020.
DOI:10.26976/d.cnki.gchau.2020.001757.
12. Pan, S. Y., & You, Z. Y. Risk Prevention Strategies for Chinese Export Enterprises under the New Situation. *Commercial Economy*, 2022(06): 70-73+106.
DOI:10.19905/j.cnki.syjj1982.2022.06.010.
13. Xue, X. Research on International Trade Risk Management of HS Company under the "Belt and Road" Initiative. Xi'an University of Architecture and Technology, 2017.
14. March, J. G., & Shapira, Z. Managerial perspectives on risk and risk taking. *Management Science*, 1987, 33(11): 1404-1418.
15. Choudhary, N. A., Singh, S., Schoenherr, T., et al. Risk assessment in supply

- chains: a state-of-the-art review of methodologies and their applications[J]. *Annals of Operations Research*, 2023, 322(2): 565-607.
16. Fan, Y., & Stevenson, M. A review of supply chain risk management: definition, theory, and research agenda. *International Journal of Physical Distribution & Logistics Management*, 2018, 48(3): 205-230.
 17. Chen, J. X., & Chen, J. From Optimization to Reshaping: High-Quality Supply Chain Development in a Changing Landscape. *Systems Engineering - Theory & Practice*, 2022, 42(03): 545-558.
 18. Gereffi, G., & Lee, J. (2012). Why the World Suddenly Cares About Global Supply Chains. *Journal of Supply Chain Management*, 48(3), 24-32.
 19. Tang, C. S., & Zimmerman, J. D. (2009). Managing New Product Development and Supply Chain Risks: The Boeing 787 Case. *Supply Chain Forum: An International Journal*, 10(2), 54-63.
 20. Simchi-Levi, D., Schmidt, W., & Wei, Y. (2014). From Superstorms to Factory Fires: Managing Unpredictable Supply Chain Disruptions. *Harvard Business Review*, 92(1/2), 96-101.
 21. Flynn, B. B., Koufteros, X., & Lu, G. (2016). On the Origins of Competitive Advantage: The Role of Supply Chain Management. *Journal of Operations Management*, 47-48(1), 1-17.
 22. Brandon-Jones, E., Squire, B., Autry, C. W., & Petersen, K. J. (2014). A Contingent Resource-Based Perspective of Supply Chain Resilience and Robustness. *Journal of Supply Chain Management*, 50(3), 55-73.
 23. Wiengarten, F., Humphreys, P., Gimenez, C., & McIvor, R. (2016). Risk, Risk Management Practices, and the Success of Supply Chain Integration. *International Journal of Production Economics*, 171, 361-370.
 24. Craighead, C. W., Blackhurst, J., Rungtusanatham, M. J., & Handfield, R. B. (2007). The Severity of Supply Chain Disruptions: Design Characteristics and Mitigation Capabilities. *Decision Sciences*, 38(1), 131-156.
 25. Sodhi, M. S., Son, B. G., & Tang, C. S. (2012). Researchers' Perspectives on Supply Chain Risk Management. *Production and Operations Management*, 21(1), 1-

- 13.
26. Chopra, S., & Sodhi, M. S. (2014). Reducing the Risk of Supply Chain Disruptions. *MIT Sloan Management Review*, 55(3), 73-80.
27. Hendricks, K. B., & Singhal, V. R. (2005). An Empirical Analysis of the Effect of Supply Chain Disruptions on Long-Run Stock Price Performance and Equity Risk of the Firm. *Production and Operations Management*, 14(1), 35-52.
28. Sheffi, Y. (2005). *The Resilient Enterprise: Overcoming Vulnerability for Competitive Advantage*. The MIT Press.
29. Gereffi, G., & Lee, J. (2012). Why the World Suddenly Cares About Global Supply Chains. *Journal of Supply Chain Management*, 48(3), 24-32.
30. Fan, Y., & Stevenson, M. (2018). A review of supply chain risk management: definition, theory, and research agenda. *International Journal of Physical Distribution & Logistics Management*, 48(3), 205-230.
31. Craighead, C. W., et al. (2007). The Severity of Supply Chain Disruptions: Design Characteristics and Mitigation Capabilities. *Decision Sciences*, 38(1), 131-156.
32. Brandon-Jones, E., et al. (2014). A Contingent Resource-Based Perspective of Supply Chain Resilience and Robustness. *Journal of Supply Chain Management*, 50(3), 55-73.
33. Wiengarten, F., et al. (2016). Risk, Risk Management Practices, and the Success of Supply Chain Integration. *International Journal of Production Economics*, 171, 361-370.
34. Mitroff, I. I., & Pearson, C. M. (1993). *Crisis Management: A Diagnostic Guide for Improving Your Organization's Crisis-Preparedness*. Jossey-Bass.
35. Simchi-Levi, D., et al. (2014). From Superstorms to Factory Fires: Managing Unpredictable Supply Chain Disruptions. *Harvard Business Review*, 92(1/2), 96-101.
36. Hendricks, K. B., & Singhal, V. R. (2005). An Empirical Analysis of the Effect of Supply Chain Disruptions on Long-Run Stock Price Performance and Equity Risk of the Firm. *Production and Operations Management*, 14(1), 35-52.
37. Shershneva Z.E. *Anti-crisis management of the enterprise*. – Kyiv: KNE, 2044. – 235 p.

38. Kovalevska A.V. Anti-crisis management of an enterprise, Kharkiv, 2016. – 140 p.
39. Bankruptcy and enterprise rehabilitation: theory and practice of crisis management / T.S. Klebanova, O.M. Bondar, O.V. Mozenkov and others. / Edited by O.V. Mozenkov. – Kh.: Publishing House “INZHEK”, 2023. – 272 p.
40. Youth Battery. (2024). How did CATL dominate the global EV battery market in 2024. <https://www.youth-battery.com/how-did-catl-dominate-the-global-ev-battery-market-in-2024/>
41. CATL. (2024). 2024 environmental, social and governance (ESG) report. https://www.catl.com/en/uploads/1/file/public/202505/20250514174222_ndwyqrs061.pdf
42. Metal.com. (2025, July 15). China tightens grip on EV battery tech with new export controls. <https://www.metal.com/en/newscontent/103438013>
43. Kitishian, D. (2025, July 2). CATL’s AI strategy: Analysis of dominance in battery industry. Klover.ai. <https://www.klover.ai/catl-ai-strategy-analysis-of-dominance-in-battery-industry/>
44. CnEVPost. (2025, February 11). Global EV battery market share in 2024: CATL 37.9%, BYD 17.2%. <https://cnevpost.com/2025/02/11/global-ev-battery-market-share-2024/>
45. Adamas Intelligence. (2024, December 18). MAPPED: CATL’s global footprint as it expands in Europe. <https://www.adamasintel.com/mapped-catls-global-footprint-as-it-expands-in-europe/>
46. Electrive. (2024, May 23). CATL to focus on international expansion. <https://www.electrive.com/2024/05/23/catl-to-focus-on-international-expansion/>
47. CnEVPost. (2025, March 14). CATL posts record Q4 2024 net income, gross margin slips. <https://cnevpost.com/2025/03/14/catl-q4-2024-earnings/>
48. Stellantis. (2024, December 10). Stellantis and CATL to invest up to €4.1 billion in joint venture for large-scale LFP battery plant in Spain. <https://www.stellantis.com/en/news/press-releases/2024/december/stellantis-and-calt-to-invest-up-to-4-1-billion-in-joint-venture-for-large-scale-lfp-battery-plant-in-spain>
49. Batteries News. (2024, March 29). CATL plans to build LFP battery plant with

GM in North America through tech licensing, report says.

<https://batteriesnews.com/catl-plans-to-build-lfp-battery-plant-with-gm-in-north-america-through-tech-licensing-report-says/>

50. Associated Press. (2025, May 20). Blacklisted in the US, Chinese battery giant raises billions in Hong Kong trading debut. Euronews. <https://www.euronews.com/business/2025/05/20/blacklisted-in-the-us-chinese-battery-giant-raises-billions-in-hong-kong-trading-debut>

51. CATL. (2024, December 18). CATL launches battery swap ecosystem with nearly 100 partners. <https://www.catl.com/en/news/6342.html>

52. BloombergNEF. (2024). Electric vehicle outlook 2024. <https://about.bnef.com/electric-vehicle-outlook/>