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# Relationship between Transaction Costs and Strategic Alliances in the High-Tech Industry

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*In order to improve efficiency, the study focuses on the deconstruction of the relationship between transaction costs and strategic alliances, and sorts out the characteristics of different transaction costs and the corresponding solutions.*
*This study analyzes the correlation between transaction costs and strategic alliances by sampling 50 suppliers that collaborate with a target company. The analysis results indicate that transaction costs vary with asset specificity, risk uncertainty, and transaction frequency. High asset specificity and risk uncertainty lead to high transaction costs, whereas increasing transaction frequency prompts suppliers to invest additional ex-ante transaction resources to reduce subsequent losses incurred by the transaction. High transaction frequency also fosters a tight partnership and improves synergistic quality. Overall, this study verifies the strong correlation between the strength of strategic alliances and transaction costs. Enterprises must reduce or control the loss of transaction costs from different levels.*
***Keywords:*** *transaction cost; strategic alliance; high-tech industry; uncertainty; asset specificity; transaction frequency*
*JEL Classifications: D22, D01, M10*

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## I. Introduction

In order to help enterprises improve efficiency, especially reduce unnecessary expenditure, this paper attempts to deconstruct the combination relationship of strategic alliances, and focuses on solving the loss caused by transaction costs.

It is no need to prove that transaction costs have a great negative impact on the operation of enterprises.As a result of current globalization trends, companies can no longer operate independently to control and reduce transaction costs. Companies, particularly those in the high-tech industry where transaction processes and industrial structure are highly complex, are increasingly seeking partnerships by forming strategic alliances. This study targets the high-tech industry and uses empirical data to explore the relationship between transaction costs and strategic alliances. Recommendations are then provided for relevant practices. At the end of the paper, the research results are simply arranged into feasible specific reference suggestions in the way of step diagram.

**Work Specialization Inefficiency Induced by Transaction Costs**

The main impact of transaction cost on enterprises is the inefficiency of organizational division of labor.

Frederick Winslow Taylor, the father of scientific management, asserts that work specialization can improve the operational efficiency of organizations. However, the increasingly complex external market has prompted scholars to propose that the scope of work specialization should be expanded beyond organizations to create a more systematic interorganizational model. This facilitates collaboration between upstream, midstream, and downstream companies in the supply chain. However, such attempts have resulted in unsatisfactory outcomes, which are mainly attributed to transaction costs, according to Nobel Prize winner Olive Williamson.

Briefly, factors such as bounded rationality, uncertainty, opportunism, asset specificity, risk, and transaction frequency cause companies to incur various uncontrollable and unquantifiable transaction costs

under information asymmetry. Consequently, neither side of a transaction can attain maximum efficiency (Benisiu and Nick, 2020).

The emergence of transaction cost theory has encouraged scholars to explore relevant topics and identify approaches to controlling and reducing transaction costs. Of the various approaches, strategic alliance formation has been prevalently adopted to share information and resources (Lee, 2000). A strategic alliance is a collaborative partnership established by two or more companies during a transaction to acquire mutual benefits. It can be viewed as a composite organizational network formed by companies with specific plans and objectives.

Although strategic alliances of different scales exist in various industries, no standards have been established for the creation of such alliances or calculation of transaction costs. This is mainly due to the complexity and diversity of transaction costs. The varying organizational models and operational systems adopted by distinct industries also impede the formulation of such standards.

## II. Literature Review—Transaction Costs and Strategic Alliances

### *1.Why are there transaction costs*

According to numerous famous scholars, including Coase, Williamson, Rindfleisch, and Heide, transaction cost theory is rooted in the following concepts (Hawkins, 2000):

*(1)Bounded rationality*

This refers to how people can never make optimal and completely rational decisions to perform efficient transactions because of informational and cognitive limitations and the presence of various risks and uncertainties. To ensure the success of a transaction, both parties must expend additional resources to devise transaction rules and monitor transaction behavior (including sanctioning violations after the transaction).

*(2)Uncertainty*

Williamson (1975, 1985) asserts that uncertainties of various degrees exist before and after a transaction. High uncertainty greatly impedes control over transaction costs. Problems associated with transaction uncertainty include the quality of transaction items, information asymmetry, and trust between transaction parties. Williamson also maintains that when parties attempt to reduce uncertainty in advance by spending time and resources to formulate transaction contracts and response measures, they inevitably incur additional transaction costs.

*(3) Opportunism*

During a transaction, parties tend to maximize their own benefits. Consequently, they might hide any unfavorable information before the transaction or even lie to other parties. Parties prefer to adopt trading methods that are advantageous to them, a tendency that causes unwillingness to resolve ex-post transaction problems or parties blaming others for problems. Those who attempt to prevent opportunism might achieve limited results because of bounded rationality, and additional resources allocated for preventing opportunism leads to increasing transaction costs, creating a vicious cycle. Williamson maintains that opportunism is mostly associated with asset specificity (e.g., transactions between large transnational enterprises involving items of specific value).

*(4)Asset specificity*

Asset specificity refers to the specific uses and value of an asset. The effect of asset specificity on transaction costs is mainly influenced by parties' reliance on the transaction items or the supply and demand relationship between the buyer and seller. In the case in which the seller is the sole supplier of a specific product for the buyer, the seller has complete control over the transaction. By contrast, if the buyer can find other sellers or develop the product on their own, the buyer then has control over the transaction. In such transaction relationships, both the buyer and seller adopt relevant defensive measures that lead to additional transaction costs.

*(5)Risk and transaction frequency*

Transaction frequency refers to the number of times a transaction occurs; various risks might be induced as the number of transactions increases. Williamson (1975, 1985) posits that when two parties regularly engage in specific transactions, they naturally establish transaction governance norms that both must comply with, thereby reducing unnecessary and repeated transaction costs (e.g., collection of transaction information and establishment of trust). When the frequency of a transaction is low, the parties lack pre-established transaction norms, which, result in various uncertainties and consequently incur additional transaction risks, in turn increasing unavoidable transaction costs .

### *2. Why to form strategic alliance*

The concept of the strategic alliance, first proposed by Hopland and Nigel (1986), refers to long-term collaboration between at least two economic entities to achieve specific corporate or departmental goals. Such alliances might involve partial equity ownership and generally yield benefits through large-scale

interorganizational collaboration across markets and fields (Hawkins, 2020).

Discussing the advantages of strategic alliances, Porter (1990) asserts that such collaboration models are established on the basis of joint ventures, research and development collaboration agreements, management, or partial equity ownership to create economies of scale, gain complementary advantages, develop new markets, or effectively manage professional, diverse relationships between alliance members.

Overall, two major advantages that large transnational enterprises gain from strategic alliances are rapid improvement of market competitiveness and effective resource allocation through helping alliance members reduce transaction costs.

The operation of strategic alliances is based on the following core concepts:

*(1)Partnership between alliance members*

Partners are the basic units constituting a strategic alliance. A partnership is a collaboration between two independent companies that mutually rely on each other, share common goals, and endeavor toward common benefits to achieve objectives that would not be achieved independently (Shahab and Allam, 2020).

Partnerships in the high-tech industry include those between raw material suppliers, component manufacturers, production manufacturing centers, logistics companies, and retailers. According to Shahab and Allam (2020), partnerships can be assessed based on the level of resource sharing and supply between partners. Factors such as partnership dependency, flexibility, quality, duration, and continuity can be used as indicators to assess a partnership. Additionally, levels of commitment and trust can be used to quantify partnership quality.

*(2)Collaboration between alliance members*

Synergy originally referred to a type of chemical reaction. A synergistic effect occurs when two or more substances are mixed to generate a combined effect greater than the sum of the separate effects of substances. From the perspective of corporate management, Drucker maintains that strategic alliances utilize the synergistic effect generated by the complementary collaboration between alliance members. The aim is for each member to maximize the mutual benefits obtained from transactions with other members while maintaining autonomy.

Judge and Dooley (2006) verify that a higher level of trust between collaborating partners reduces the cost of transactions between them. This in turn increases the likelihood of opportunistic behavior, however. Mitchell and Chen (2020) indicate that when the trust and dependency between collaboration partners are increased, unnecessary transaction costs (e.g., monitoring and sanction costs) are reduced, and the level of collaboration is increased.

**Research Hypotheses**

According to the literature review and the research objectives of this studyand that at the end the research results may be simply arranged into feasible specific reference suggestions in a step diagram, the following hypotheses are proposed:

(1) H1: High uncertainty between alliance members leads to high transaction costs.
(2) H2: High asset specificity in transactions leads to high transaction costs.
(3) H3: High transaction frequency between alliance members leads to high transaction costs.
(4) H4: High asset specificity in transactions leads to tight partnerships.
(5) H5: High uncertainty between alliance members leads to estranged partnerships.
(6) H6: High transaction frequency between alliance members lead to tight partnerships.
(7) H7: Alliance members who expend high ex-ante transaction costs create tighter partnerships.
(8) H8: Tight partnerships entail lower ex-post transaction costs.

**Research Framework and Research Design**

***(1) Research framework***

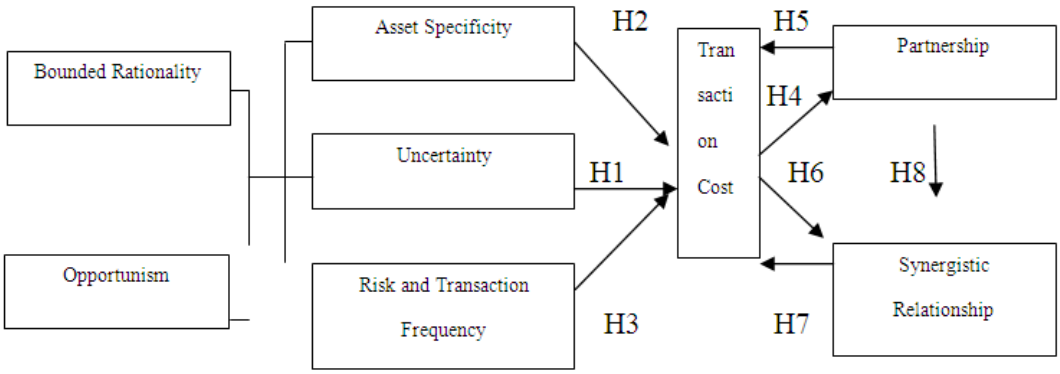


***Figure 1. Research framework***

According to literature regarding the transaction costs incurred by bounded rationality and opportunism, this study adopts asset specificity, uncertainty, and risk and transaction frequency as independent variables, and changes in the relationships of transaction costs with partnerships and synergistic relationships are considered dependent variables.

Regarding the operational definition of each variable, this study defines asset specificity as the specific use of assets and categorizes it into explicit physical assets and implicit human resources. Uncertainty is defined as the level of difficulty in predicting the transaction outcome between two parties. Risk and transaction frequency is based on the number of transactions between alliance members in a single season; transaction frequency is further categorized into high, moderate, and low. Transaction costs are defined as extra costs incurred before and after a transaction, including hidden costs such as time and psychological resources. Transaction costs are measured using the methods employed by Griffith, Roseman, and Shang (2020) and Wu, Chu, and Fang (2006). On the basis of Williamson's (1975, 1985) approach, this study accounts for ex-ante and ex-post transaction activities and the formation of strategic alliances to examine the establishment of a transaction relationship, monitoring of transaction processes, solutions to transaction problems, and advantages associated with acquiring new alliance members. Partnerships and synergistic relationships are defined as the collaboration experience and outcomes of transaction parties. According to Leal, Ponce, and Puerto (2020) and Chen and Chang (2007), variables affecting partnerships and synergistic relationships are defined as relationship dependency, flexibility, quality, duration, and continuity.

All variables are measured using a 5-point Likert scale, with scores ranging from 1 (Strongly disagree) to 5 (Strongly agree).

***(2) Research methods***

This study targets Jabil Green Point, a large transnational company in the high-tech industry, and the 50 upstream and downstream suppliers collaborating with the company in producing a product in one season.

A questionnaire was administered to collect data. The questionnaire was designed with the following six sections: the supplier's basic information; collaboration with the target company (risk and transaction frequency); asset specificity; transaction costs; partnerships and synergistic relationships; and demographic information.

Data are analyzed using descriptive statistics, correlation analysis, and regression analysis.

## III. Results

A total of 50 questionnaires were distributed, and the researchers guided respondents individually in completing them. Therefore, the questionnaires had a 100% valid return rate.

To facilitate statistical analysis, this study uses Jabil Green Point as the base point and categorized the suppliers into upstream or downstream. Upstream suppliers are those providing components and raw materials, whereas downstream suppliers are responsible for logistics and retailing. This study examines only suppliers who have collaborated with the target company for at least 5 years with an average mean collaboration value of 10 million RMB. Accordingly, 25 upstream and 25 downstream suppliers are selected.

**Pretest phase**

***(1) Descriptive statistics***

Of the upstream suppliers, 12 are integrated circuit suppliers, 8 are joint ventures that mostly provide electronic panels, and 5 are domestic suppliers that provide cables, batteries, and product packaging services.

Because all downstream suppliers selected in this study provide foreign and domestic services for long-distance transportation, the suppliers are composed of 50% domestic logistics companies and 50% foreign logistics companies. The transaction items are concentrated on raw materials (logistics) and products (retailing).

The transaction costs of upstream suppliers who collaborated with the target company for at least 5–8 years are mostly incurred by damage to raw materials during transportation (50% of all transaction costs). Regarding upstream suppliers who collaborated with the target company for 5 years or less, their transaction costs are mostly constituted of costs incurred by ex-ante negotiations (40%) and monitoring the parties' compliance with contract provisions (30%). Of the downstream suppliers, the transaction costs of logistics service providers mostly derive from ex-post revisions of transaction contracts (60%), whereas those of retailers mostly result from the processing of product feedback and communication with consumers (50%).

The descriptive statistics of questionnaire item scores are detailed as follows. Regarding asset specificity, the mean score of physical assets is 2.65 ± 0.712; the items related to professional research and development technology exhibit the highest mean score (3.25). This indicates that although the target company and suppliers emphasize research and development of professional technology, they exhibit a moderate score (slightly higher than the mean score of 3) in terms of asset specificity in components and raw materials. The mean score of human resource assets is 2.55 ± 0.736; specifically, the time expended by suppliers to confirm the needs of the target company regarding high-tech product manufacturing exhibits the highest mean score of 3.25. This indicates that regarding asset specificity in human resources, the target company and suppliers highly emphasize communication during a transaction.

The mean score of the uncertainty items is 2.56 ± 0.622. Of these items, only those concerning components, raw materials, and the quality control requirements of the target company exhibit a mean score of 3.2. The means scores of the remaining items are <3.0. This indicates that the target company and suppliers are able to control most uncertainty problems, including pricing, volume, and time. In particular, suppliers who collaborated with the target company for longer periods demonstrate more favorable ability to control uncertainty.

Regarding items related to transaction costs, the mean scores are all >3.8, except for those related to self-serving needs. Negotiation costs during a transaction exhibit the highest mean score (3.86), followed by transaction costs incurred to establish a collaborative relationship (3.45). Notably, the item related to the establishment of a collaborative relationship to manufacture specific high-tech products exhibits a high score of 3.92.

The suppliers in this study expend low ex-post transaction costs; this is verified by the low mean score of relevant items (2.45). This suggests that the target company and suppliers already expended additional contract costs prior to transactions, and that both parties have complied with the contracts. This phenomenon is particularly notable in suppliers that have collaborated with the target company for a longer period or received a large payment from the target company.

Regarding items related to partnerships and synergistic relationships, this study discovers that the target company and suppliers pay closest attention to relationship quality (3.86), followed by relationship continuity (3.52). The mean scores of the remaining items are >3.0, indicating that the target company and suppliers have fostered a tight partnership and favorable synergistic relationship.

***(2) validity and reliability***

First, in terms of validity test, this study refers to the relevant and published literature at home and abroad to set up various aspects, so it has a certain degree of content validity. Secondly, in terms of reliability, Cronbach's α coefficient is used to test the reliability. The results show that the reliability coefficients of each facet in this paper range from 0.73 to 0.92 (both greater than 0.6). Therefore, the stability of the three constructs in this paper is also acceptable. To the matching degree of the overall measurement mode, the chi square DOF ratio $\chi$ 2 / DF (342.23 / 179) = 1.91, RMSEA value of 0.101, nnfi value of 0.95, CFI value of 0.95, IFI value of 0.94, etc., all the values were also in the acceptable range.

**Empirical**

***(1) Difference tests of measurement variables***

Differences in transaction costs, partnerships, and synergistic relationships of upstream and downstream suppliers reveal that the upstream suppliers exhibit higher transaction costs than do the downstream suppliers. Transaction frequency, transaction amount, and collaboration time of all suppliers indicate that their transaction costs and maintenance of the partnership/synergistic relationship differ nonsignificantly with respect to these variables.

***(2) Analysis of correlations among variables***

**Table 1** Correlation analysis of relevant variables

| | | Asset specificity | Uncertainty | Transaction cost | | | | Strategic alliance | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3 | 4 | 5 | 6 |
| Asset specificity | | 1.00 | | | | | | | |
| Uncertainty | | 0.092 | 1.00 | | | | | | |
| Transaction cost | Relationship establishment cost 1 | 0.682* | -0.042 | 1.00 | | | | | |
| | Monitoring cost 2 | 0.506** | -0.062 | 0.453** | 1.00 | | | | |
| | Dispute resolution cost 3 | 0.438** | 0.058 | 0.247* | 0.148 | 1.00 | | | |
| | Self-serving need 4 | 0.206* | 0.468** | 0.091 | -0.022 | 0.000 | 1.00 | | |
| Strategic alliance | Quality of synergistic relationship 5 | 0.308** | 0.108 | 0.182 | 0.061 | 0.122 | -0.121 | 1.00 | |
| | Maintenance of partnership 6 | 0.282** | -0.226* | 0.168 | 0.080 | 0.188* | -0.024 | 0.301** | 1.00 |

Pearson's correlation coefficient analysis was conducted to determine relationships among variables. The results reveal that asset specificity is highly correlated with various variables, including transaction costs, partnerships, and synergistic relationships. Particularly, the correlation coefficient between asset specificity and relationship establishment costs is 0.682. In addition, uncertainty is positively correlated with suppliers' self-serving needs and negatively correlated with partnership maintenance. The relationship between transaction costs and strategic alliances indicates that only dispute resolution costs and partnerships exhibit a significant, though weak, correlation.

***(3) Regression analysis***

Table 2 Regression analysis of relevant variables

| | | Transaction cost | | | | Strategic alliance | |
|---|---|---|---|---|---|---|---|
| | | Relationship establishment cost | Monitoring cost | Dispute resolution cost | Self-serving need | Quality of synergistic relationship | Maintenance of partnership |
| Uncertainty | | -0.026 | -0.074 | 0.050 | 0.476 *** | 0.073 | -0.2520* |
| Asset specificity | | 0.612 *** | 0.518 *** | 0.402 ** | 0.316 ** | 0.313 * | 0.286 * |
| Risk and transaction frequency 1 (low) | | -0.014 | -0.150 | -0.133 | 0.116 | 0.252 | -0.007 |
| Risk and transaction frequency 2 (high) | | 0.134 | 0.073 | -0.030 | -0.078 | -0.039 | 0.091 |
| Transaction cost | Relationship establishment cost | | | | | 0.072 | 0.092 |
| | Monitoring cost | | | | | | |
| | Dispute resolving cost | | | | | 0.018 | 0.130 ** |
| | Self-serving need | | | | | | |
| Strategic alliance | Quality of synergistic relationship | | -0.038 | | -0.333** | | |
| | Maintenance of partnership | | -0.236** | | 0.116 | | |
| F value | | 19.698 *** | 5.178 *** | 4.844 ** | 6.128 *** | 2.422 * | 6.338 *** |
| P value | | 0.000 | 0.000 | 0. 018 | 0.000 | 0.033 | 0.000 |
| Adjusted $R^2$ | | 0.485 | 0.238 | 0.166 | 0.283 | 0.100 | 0.288 |

* P < 0.05; **P < 0.01; ***P < 0.001

To facilitate regression analysis, this study collects low risk and transaction frequency data from those who collaborated for <5 years and high risk and transaction frequency data from those who collaborated for ≥5 years.

Regression analysis was performed to examine the effects of asset specificity, uncertainty, and risk and transaction frequency on transaction costs (relationship establishment costs, monitoring costs, dispute resolution costs, and costs derived from suppliers' self-serving needs) and strategic alliance variables (e.g., partnership maintenance and level of synergistic relationship). Risk and transaction frequency is considered a dummy variable, with values 1 and 2 representing low frequency and high frequency, respectively.

The analysis results indicate that uncertainty only exerts a positive effect on the costs derived from suppliers' self-serving needs. When two transaction parties collaborate to trade regularly, the level of uncertainty is reduced. Uncertainty does not significantly affect relationship establishment costs, monitoring costs, or dispute resolution costs. Nevertheless, suppliers with high uncertainty are less likely to comply with

transaction contracts. When suppliers must ensure their self-serving needs, they might also sacrifice the benefits of the target company. Therefore, H1 is partially validated.

The results also indicate that asset specificity significantly and positively affects transaction costs; during a transaction process, high asset specificity leads to high transaction costs. Asset specificity and relationship establishment costs exhibit the strongest correlation ($\beta = 0.612$). This implies that when a supplier attempts to establish a collaborative relationship with the target company, they maintain the specificity of their products by spending additional resources to acquire information about the company and confirm the content of collaboration contracts. This behavior conforms to H2, which states that high asset specificity leads to high transaction costs.

Regarding risk and transaction frequency, the results suggest that this variable does not affect transaction costs. Specifically, descriptive statistics suggest that suppliers who have collaborated with the target company for a longer period and received larger payments from the company enjoy lower transaction costs. However, regression analysis determined that the reduction in transaction costs is not noticeable. This means that transaction costs do not vary with risk and transaction frequency. Thus, H3 is rejected.

Next, the reciprocal effects between transaction costs and strategic alliances are examined. The aforementioned results have already demonstrated that only asset specificity and uncertainty affect the maintenance of partnerships and quality of synergistic relationships. Particularly, asset specificity significantly, positively affects these two dependent variables, whereas risk and transaction frequency does not affect them. Therefore, H4 is validated, H5 is partially validated, and H6 is rejected.

This study also discovers that dispute resolving costs significantly and positively affect relationship continuity in strategic alliances. Relationship establishment costs positively affect the maintenance of partnerships; however, this effect is nonsignificant. Therefore, H7 is partially validated. The maintenance of partnerships and quality of synergistic relationships negatively affect monitoring costs and suppliers' self-serving needs. This means that when the transaction parties have a tight partnership and high-quality synergistic relationship, additional transaction costs accrue to sustain the stability of their partnership. Therefore, H8 is partially validated.

## IV. Summary

Regarding the use of strategic alliances to reduce transaction costs in the high-tech industry, this study discovers that asset specificity is the most crucial factor in a transaction. Controlling the transaction costs of assets with high specificity is challenging because such assets involve professional technology or patents.

Nevertheless, companies are trending toward the establishment of tight partnerships to enhance the quality of synergistic relationships with partners, thereby reducing the transaction costs incurred by uncertainty.

Collaborating companies also invest additional ex-ante transaction resources to ensure the success of a transaction and reduce ex-post losses. This prompts companies to form tighter strategic alliances and improve their synergistic relationships, which are marginally affected by risk and transaction frequency.

**Table3** Research hypotheses

| Hypothesis | Validation |
|---|---|
| H1: High uncertainty between alliance members leads to high transaction costs. | Partially validated |
| H2: High asset specificity in transactions leads to high transaction costs. | Validated |
| H3: High transaction frequency between alliance members leads to high transaction costs. | Rejected |
| H4: High asset specificity in transactions leads to tight partnerships. | Validated |
| H5: High uncertainty between alliance members leads to estranged partnerships. | Partially validated |
| H6: High transaction frequency between alliance members lead to tight partnerships. | Rejected |
| H7: Alliance members who expend high ex-ante transaction costs create tighter partnerships. | Partially validated |
| H8: Tight partnerships entail lower ex-post transaction costs. | Partially validated |

So, through the combination operation of strategic alliances, the loss of post transaction costs can be controlled. Although the loss of prior transaction costs can not be completely avoided, it is not a complete waste for alliance members, especially in accumulating their cooperation experience.

Based on the above discussion, this paper sorts out the important research findings into the following figures for reference:

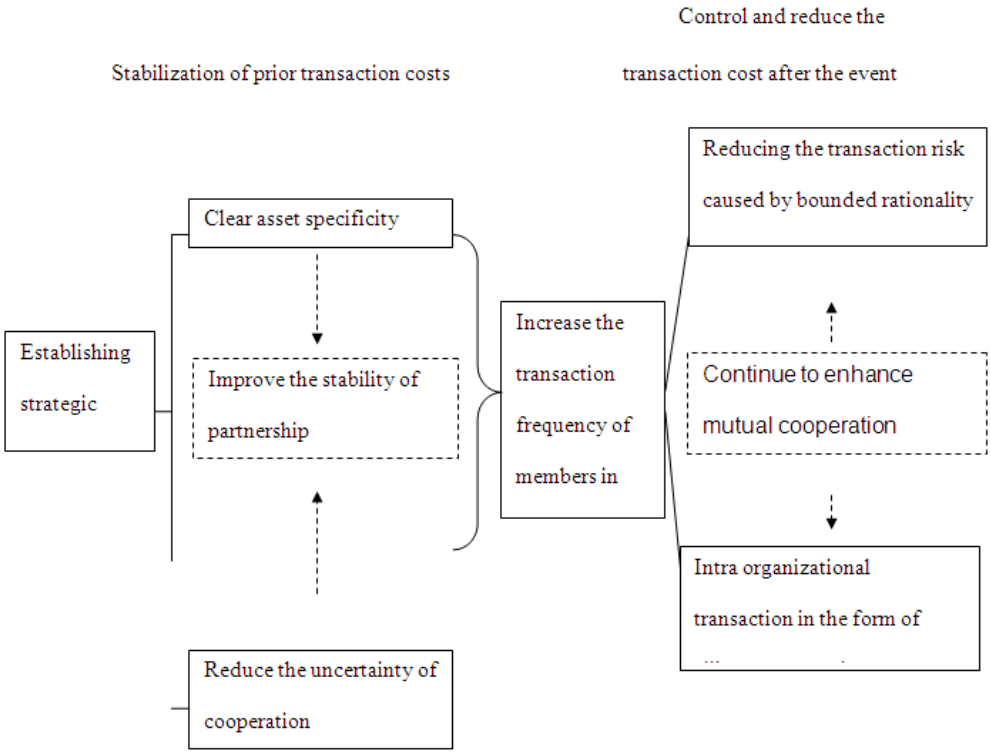


**Figure 2:** operation process of controlling transaction cost by enterprise strategic alliance

## V. Conclusions and Recommendations

Resolving problems concerning transaction costs can be highly difficult, as Olive Williamson stated during the Nobel Prize Award Ceremony. As long as markets exist, transaction costs are inevitable.

This empirical study targets a transnational company to examine three essential variables of transaction costs, namely uncertainty, asset specificity, and risk and transaction frequency, and their correlations with partnerships and synergistic relationships in strategic alliances.

The results verify that transaction costs are highly correlated with strategic alliances. Particularly, asset specificity exhibits a strong positive correlation with transaction costs. High uncertainty also increases transaction costs. Therefore, companies must rely on their long-term experience of collaborating with other alliance members to improve their synergistic relationships and reduce losses incurred by transaction costs. Alliance members must also invest additional ex-ante transaction resources to reduce the self-serving needs of transaction parties. This approach is effective in controlling ex-post transaction costs, including monitoring and dispute resolution costs.

On the other hand, the study confirms that although transaction costs cannot be completely avoided, they are not uncontrollable. We finds that investing more pre transaction costs to consolidate alliance cooperation relationship can reduce the self-interest demand mentality of traders in the long-term cooperation process in the future, so as to control and gradually reduce the loss of transaction costs after the event To effectively control the cost of supervision and settlement of disputes.

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