Research on the Application of Value Chain Restructuring under the Digitalization Strategy : A Case Study of Musical Instrument Manufacturing Enterprise V in Guangzhou

Yupeng He[1], Juan Xia[2],Yuefeng Xiao[3], Jie Yang[4]*

{12034513@qq.com[1], 851081743@qq.com[2], 1037638696@qq.com[3], yang66@263.net[4*] }

Guilin University of Electronic Technology, Guilin 541004, Guangxi Province, China[1, 2, 3,4]

Abstract. This paper conducts an in-depth study on the business model of enterprises by using interdisciplinary comparative methods, survey methods, literature review, and mathematical analysis. The digital analysis approach is employed to assess the strategic decisions based on the industry value chain, addressing the challenges of value chain restructuring in small and medium-sized musical instrument manufacturing enterprises. By analyzing real data from Company V and utilizing mathematical analysis, optimized solutions for the value chain restructuring of small and medium-sized musical instrument manufacturing enterprises in Guangzhou within the global circulation are proposed. This study provides a Chinese solution for similar manufacturing enterprises to utilize digital tools in strategic analysis and repositioning. The innovation lies in the integration and application of digital methods to analyze the strategic decision-making process of Company V, providing a Chinese smart solution for value chain restructuring in similar manufacturing enterprises.

Keywords: digital strategy; value chain; decision-making

1 Introduction

Small and medium-sized enterprises (SMEs) are facing the challenge of strategic repositioning in the wave of digital transformation. Only with a well-defined strategic positioning can they achieve better industrial upgrading and optimize their business and profit models. In order to study the practical problems faced by SMEs in strategic repositioning more accurately, the research team of this project conducted an in-depth study on Company V and collected and analyzed data over a period of one year and three months.

Company V is a violin manufacturing enterprise with independent brands RedBeauty and Ruby. It produces high and middle-end violins, violas, cellos, and double basses. Previously, the company primarily exported to over 20 countries including Europe and the United States, with about 81.3% of annual production capacity being export volume from 2010 to 2019. However, since the outbreak of the COVID-19 pandemic in 2020, the company has faced significant export pressure, with export volume sharply declining each year, reaching 11.2% in 2022. The company is facing a severe survival crisis. In the context of the "14th Five-Year Plan", the Party Central Committee proposed the concept of "dual circulation", which brings new development

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opportunities for enterprises. In this backdrop, the company faces the need for strategic adjustments in market orientation and decides to redirect the high-quality excess export capacity to the domestic market for "internal circulation". However, due to changes in competitors, internal and external environments, potential threats, and opportunities, Company V is confronted with various uncertain market factors when it comes to anchoring market sales areas and formulating market sales strategies. Which type of strategy should be adopted, expansion-oriented, conservative, or other types? Faced with various uncertainties, the company urgently needs a feasible and innovative solution to explore a new blue ocean[1].

2 Proposal for Value Chain Restructuring Solution

In the 2009 study titled "A study on the application of blended learning theory in practical teaching of program design" [2], the concept and model of blended stereoscopic teaching were proposed, clearly explaining the concept of "blended." Based on the concept of "blended," the study explored the extension of the value chain for instrument manufacturing enterprises, integrating training and educational resources for instruments, and integrating sales. Through the restructuring of the value chain, it aimed to create a commercial blue ocean for small and medium-sized instrument production and import-export enterprises, breaking through international trade barriers, and achieving a competitive advantage in the business war to create greater value for the industry.

Furthermore, in the 2017 paper titled "Research on numerical data clustering algorithm in hybrid large-scale databases" [3], a clustering algorithm was developed. The idea and application of this clustering algorithm can be applied in the business value chain restructuring by utilizing the mathematical tools of computer analysis and data clustering mentioned in the paper, providing strong mathematical support for constructing a value chain model for small and medium-sized instrument production and import-export enterprises.

In the paper titled "Study on the application of M-Commerce in the reconstruction of enterprise value chain in Guangzhou, China" [4], the author proposed a solution based on cross-border integration of mobile e-commerce value chains. These studies provided the theoretical and conceptual foundations for this paper.

Value chain restructuring plays a crucial role in reconstructing the profit structure. Building on this idea, the research team conducted further market research and analysis, delving into the following questions regarding consumer behavior:

1. What are the true needs of the buyers?

2. What concerns might the buyers have?

3. Are buyers genuinely sensitive to prices?

4. In addition to purchasing musical instruments, what else do buyers need?

5. What pain points do buyers encounter when purchasing musical instruments?

These questions were addressed through interviews and surveys of 1000 consumers, with 91.3% of buyers being parents of students aged 5-16. The real purpose of these parents in purchasing violin instruments was to let their children learn musical instruments and develop a skill. 81.4%

of buyers expressed concerns about their children giving up halfway, resulting in wasted instruments. Due to the fear of wasting money, these parents hesitate to buy better instruments. Through interviews, it was discovered that the pain point for parents and teaching instructors was poor instrument quality, resulting in off-pitch or noisy sounds. This demotivates children during their learning process, making teaching a challenge, and forming a vicious cycle that leads to a high probability of children giving up midway and causing significant student attrition for music schools and training institutions. Another issue raised was that when purchasing musical instruments, parents prioritize reliable teaching resources, with over 78.6% of respondents holding a bachelor's degree or higher education. They are economically well-off and not particularly price-sensitive to instruments. Their primary concern is the quality of education for the next generation. A common issue among them is that they are willing to spend significantly to purchase expensive instruments if they can find superior teaching resources, such as renowned instructors guiding their children.

3. Justification of the Overall Solution Approach

3.1. The analysis of data on the attractiveness of the domestic market

The data analysis of the "Analysis of the Attractiveness of the Domestic Market for High-quality Violin Teaching as an Overall Solution Approach: A Summary of Interviews with 100 Experts" is presented in Table 1. Through an analysis of the attractiveness of the domestic market for violin instruments, it was found that this market holds significant appeal.

Table 1. A data table of violin domestic market attractiveness analysis data compiled after interviewing 100 experts in March 2023

Number	Project	Weighted average score on a 5-point scale	Score on a 100-point scale
1	Market size	3.55	71.0
2	Profitability level	4.03	80.6
3	Growth rate	4.17	83.4
4	Growth potential	3.85	77.0
5	Lifecycle potential	3.84	76.8
Overall average score		3.89	77.76

3.2. Data acquisition and analysis

3.2.1. External factors data

Considering that experts have in-depth research on policy orientation, economic development, cultural characteristics, and technological frontiers, the method of expert interviews is selected when scoring external factors of enterprises. Specifically, for the external factors analysis of the

enterprise, 100 experts were invited to rate the opportunities and threats presented in Table 3-2, using a 5-point scale. A higher score indicates that the experts perceive a greater impact of the factor on the overall solution approach for violin teaching. The distribution of the number of experts for each score value regarding the opportunities and threats is summarized in Tables 2 and 3.

Table 2. A data table of violin domestic market attractiveness analysis data compiled after interviewing 100 experts in March 2023

Score	The integration of products and teaching services highlights the sales advantage	Huge domestic consumer demand	Policy support from the government under the "dual circulation" development pattern	Increased consumer confidence in the domestic market after the end of the epidemic	Rapid improvement in profitability after capacity optimization
5	59	48	40	50	37
4	29	21	35	28	24
3	8	16	15	15	26
2	3	5	2	2	6
1	1	10	8	5	7

Table 3. Threat distribution data

Score	Fierce Market Competition Persists	Product Competition Shifts to Education Service System	The Maturity of Alignment between Education Services and Products is Incomplete
5	20	10	22
4	22	15	21
3	15	24	15
2	23	22	22
1	20	29	20

3.2.2. Internal factors data

A SWOT analysis table was constructed to evaluate the strengths and weaknesses of V Company's overall solution in the violin teaching business, with a particular focus on internal factors. This analysis was conducted as part of a market research study involving 1000 consumers. A 5-point scale was utilized to measure consumer perception, wherein higher scores denoted a greater perceived prominence of V Company's overall solution in violin teaching in relation to specific factors. Subsequently, an examination of the distribution of strengths and

weaknesses across various score levels was carried out, and the findings are presented in Tables 4 and 5.

Table 4. Strengths distribution data

Score	Excellent musical instruments and teaching quality	Good reputation of teaching staff	Favorable word-of-mouth	High overall service value for money, providing peace of mind to consumers
5	501	523	465	534
4	299	375	378	324
3	100	50	86	79
2	70	31	36	33
1	30	21	35	30

Table 5. Weaknesses distribution data

Score	Lack of overall operational experience	Incomplete development of production, sales, and teaching systems	Absence of target consumer groups	Immature domestic sales network system
5	420	104	100	105
4	310	56	78	89
3	154	120	101	87
2	61	320	321	320
1	55	400	400	399

3.3. Quantitative analysis of SWOT[5]

3.3.1. Calculation method

Step 1: The mean scores of the evaluation factors were calculated.

Step 2: The frequency Pi was calculated according to the standard deviation formula (1).

$$\boldsymbol{\sigma = \sqrt{\sum (\mathbf{x_i} - \overline{\mathbf{x}})^2 \times \mathbf{P_i}}} \quad (\mathbf{1})$$

Step 3: Calculate the squared deviation $(\mathbf{x_i} - \overline{\mathbf{x}})^2$.

Step 4: Calculate standard deviation σ according to standard deviation formula (1).

Step 5: Calculate the coefficient of variation V and the sum of coefficients of variation $\sum \mathbf{v}$.

Step 6: Calculate the weight Wi according to the weight formula Wi=$\mathbf{V_i} / \sum \mathbf{V_i}$.

3.3.2. Calculation of the final score

Based on the comprehensive evaluation scoring and weight results above, the strategic selection EFE matrix for V Company's overall solution for violin teaching is presented in Table 6. In this table, by calculating the weighted average of the "weights" and "scores," the final score $\overline{\mathbf{o}}$ for opportunities is determined to be 4.01 points. Similarly, the threat evaluation matrix is constructed, and the final score $\overline{\mathbf{T}}$ for threats is calculated to be 2.85 points. The opportunity evaluation matrix and threat evaluation matrix together form the external factor evaluation matrix, namely the EFE matrix, as shown in Table 6.

Table 6. EFE Matrix of Strategic Options for a Total Solution for Violin Teaching at Company V

	Key external factors	Weight	Score (1-5)	Weighted average
Opportunity（O）	1. The integration of products and teaching services makes the status of sales channels prominent	14.00%	4.42	0.60
	2. Domestic consumer demand is huge	24.07%	3.92	0.94
	3. National policy support under the "dual circulation" pattern	20.97%	3.97	0.83
	4. After the end of the epidemic, domestic consumer confidence has risen	18.51%	4.16	0.77
	5. The profitability after capacity optimization increases rapidly	22.84%	3.78	0.86
	Final Score			4.01
Threat（T）	1. Intense Market Competition Continues	32.62%	2.98	0.97
	2. Product Competition Shifts to Competition in the Educational Service System	34.91%	2.55	0.89
	3. The Degree of Alignment between Educational Services and Products is Not Fully Matured	32.47%	3.03	0.98
	Final Score			2.85

Similarly, the internal factor evaluation IFE matrix was constructed and is presented in Table 7.

Table 7. IFE Matrix of Strategic Options for a Total Solution for Violin Instruction at Company V

	Key internal factors	Weight	Score (1-5)	Weighted average
Strengths（S）	1. Excellent quality of musical instruments and teaching	27.81%	4.17	1.16
	2. Good reputation of teachers	22.03%	4.35	0.96
	3. Good reputation	25.66%	4.20	1.08

	4. the overall cost-effective service, so that consumers save money	24.51%	4.30	1.05
	Final Score			4.25
Weaknesses（W）	1. Lack of overall operating experience	13.72%	0.55	0.55
	2. production, sales, teaching system is not fully mature	28.63%	0.61	0.66
	3. Terminal consumer groups have not formed a scale effect	28.71%	2.35	0.62
	4. Domestic sales network has not formed a mature system	28.94%	2.63	0.63
	Final Score			2.46

The final score for dominance was calculated as $\overline{\mathbf{s}}$=4.25，$\overline{\mathbf{w}}$=2.46.

3.4. Establishment of a matrix of strategic options and strategic decision-making

3.4.1. Development of a matrix of strategic options

Opportunities and threats constitute the external factors of a business. By calculating the ratio of the final score $\overline{\mathbf{o}}$ for opportunities divided by the final score $\overline{\mathbf{T}}$ for threats, if the ratio is greater than 1, it indicates that opportunities outweigh threats. Conversely, if the ratio is less than 1, it indicates that threats outweigh opportunities. In such cases, the company is not suitable for aggressive actions.

Strengths and weaknesses constitute the internal factors of a business and are used to depict its competitiveness. By calculating the ratio of the final score $\overline{\mathbf{s}}$ for strengths divided by the final score $\overline{\mathbf{w}}$ for weaknesses, if the ratio is greater than 1, it indicates that strengths outweigh weaknesses, and the company is competitive. Conversely, if the ratio is less than 1, it indicates that weaknesses outweigh strengths, and the company lacks competitiveness. In such cases, the company should adopt defensive strategies and avoid aggressive actions.

By calculation, the following result is obtained.

1. $\frac{\overline{\mathbf{o}}}{\overline{\mathbf{T}}} = \frac{4.01}{2.85} \approx 1.40927189 > 1$
2. $\frac{\overline{\mathbf{s}}}{\overline{\mathbf{w}}} = \frac{\mathbf{4.25}}{\mathbf{2.46}} \approx 1.726949813 > 1$

A scatter plot is made with $\frac{\overline{\mathbf{o}}}{\overline{\mathbf{T}}}$ as the horizontal coordinate and $\frac{\overline{\mathbf{s}}}{\overline{\mathbf{w}}}$ as the vertical coordinate, and the axes are adjusted so that they intersect at 1 to obtain the strategic choice matrix plot shown in Figure 1.

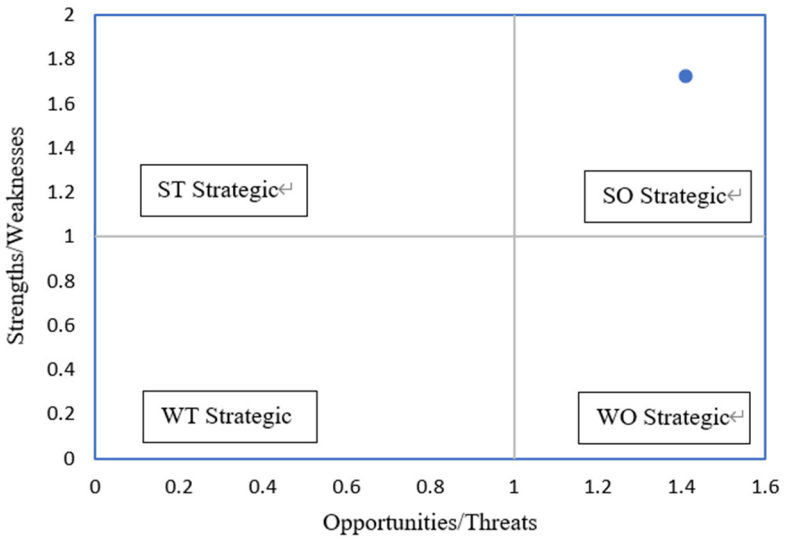

Figure 1. Scatter Matrix of Strategic Options for a Total Solution for Violin Instruction at Company V

3.4.2. strategic decision

Based on the Figure 1 , it is evident that the company should opt for a strategy based on strengths and opportunities (SO strategy), focusing on growth. By capitalizing on external opportunities and leveraging internal strengths, the company can strive to achieve the optimal business state.

Furthermore, the mathematical analysis presented above serves to validate the feasibility of the overall solution for value chain restructuring in the context of digital strategic decision-making for a Guangzhou musical instrument manufacturing enterprise.

4. Conclusion

After enduring the baptism of the COVID-19 pandemic, market competition has become increasingly fierce, and the looming trade wars have added to the challenges. Enterprises need to survive and seek new opportunities in the market. Simultaneously, they need to reevaluate their business positioning and consider whether to enter an existing value chain or establish a new one. Entering an existing value chain often entails facing inherent competitive barriers from established companies, while establishing a new value chain involves greater risks in uncharted territories.

In this paper, we propose a solution for optimizing the industrial value chain based on the mindset of reconstruction. In the face of industry challenges, we upgrade the traditional single production and sales model to a comprehensive solution model that combines product offerings with teaching services. The reconstruction of the value chain under cross-boundary reconstruction thinking allows enterprises to carve out their own blue ocean , thus ensuring their competitive advantage and significant implications for their development.

However, this paper has certain limitations. Although the feasibility of the proposed solution is demonstrated within the scope of mathematical analysis, it still requires practical validation. Our research team will continue to validate the project in practice and hopes to present an empirical research report at the next conference. By scientifically deconstructing, reconstructing, and redefining the industrial value chain, we aim to optimize the profitability of Guangzhou's small and medium-sized import-export enterprises in the context of the dual circulation of the global and domestic markets.

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