

# Technological innovation, brand positioning, and cost competitiveness: Basis for enhanced mobile chip company competitive advantage framework

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## Abstract

With the emergence of modern innovation revolutions, the evolution of the mobile chip industry is changing with each passing day. The development of chip companies requires companies to always maintain the leading position of productivity and production relations. It is crucial for mobile chip companies to maintain their core competitiveness in the increasingly fierce market competition. This article aims to provide guidance and suggestions for mobile chip companies to enhance their competitiveness through a series of effective measures by deeply analyzing the main elements of the development of mobile chip companies, including technological innovation, brand positioning, and cost competitiveness, combined with modern scientific and technological means and modern management systems. Through the concept of innovative development, mobile chip companies can keep the vitality and leading position of their products in a changing market environment and continue to lead the development direction of the market through the organic combination of technological innovation and product planning. Mobile chip companies can deeply implant their brand value into the hearts of customers through the effective construction of their own brand positioning, continuously improve user stickiness, and thus further improve their own competitiveness. Mobile chip companies use modern means to carry out all-round scientific management of costs, organically combine various production factors, and reduce corporate costs while ensuring product and process leadership, so as to escort the company's further long-term planning. Descriptive survey method is used in this report to evaluate the performance of enterprises in various dimensions of technological innovation, brand positioning and cost competitiveness. The numbers of participants are consisting of different level of employees from junior engineer, senior engineer, staff engineer to high level director engineering as well as project management staff across different levels, from different sites of company over 400 employees in China. To ensure the accuracy and consistency of the data samples, all participants in the study are employees who have passed the company's probationary period. Through the analysis and statistics of three factors, including technological innovation, brand positioning and cost competitiveness, this paper comprehensively evaluates the competitive advantages of

mobile chip company in various dimensions. In-depth analysis of the three typical dimensions of each typical variable, the paper aims to make corresponding analysis and suggestions for the current challenges faced by mobile chip enterprise and provide guidance and suggestions for enterprises to maintain sustainable competitiveness in the complex market competition. Through the investigation of this article, it is concluded that respondents moderately agree with the efforts and achievement on the technological innovation including innovation culture and management, technology transfer and commercialization, research and development. Respondents moderately agree with the efforts and achievement on the brand positioning including brand assets, brand values, and brand personality. Respondents moderately agree with the efforts and achievement on the cost competitiveness including production efficiency, logistics, and innovation efficiency. There is highly significant relationship among technological innovation, brand positioning and cost competitiveness. Furthermore, an enhanced competitive advantage framework was developed that can be applied in chip mobile company. Moving forward, the mobile chip companies may integrate a cross-functional review committee and data-driven tools to ensure Research and Development project prioritization aligns with strategic goals and market needs. The companies may invest in continuous market analysis and employee upskilling programs to sustain innovation and maintain its competitive edge in cutting-edge technology. The companies may establish strong relationships with suppliers and implement a supplier performance evaluation system to maximize negotiation leverage and ensure consistent quality and supply. The mobile chip companies may use the enhanced competitive advantage framework to improve its performance. Future researchers may explore the framework's applicability in other industries and incorporate emerging factors like sustainability and digital transformation to broaden its relevance.

**Keywords:** technological innovation, innovation culture and management, brand positioning, technology transfer and commercialization, cost competitiveness, brand value and personality, production efficiency, logistics digital economy, cost efficiency, product competitiveness

## **Technological innovation, brand positioning, and cost competitiveness: Basis for enhanced mobile chip company competitive advantage framework**

### **1. Introduction**

With the continuous development of the global digital economy, the digital society has become an inevitable development of all countries in the world today. In the era of digital economy, a batch of emerging social products have emerged, which are constantly changing the production and lifestyle of human society (Saniuk et al.,2022). Thanks to the continuous rapid development of the information age, the development of wireless communication has also made revolutionary breakthroughs in recent years. From 2G to 3G, from 3G to 4G, from 4G to 5G, each generation of wireless communication development, accompanied by the continuous breakthrough of the digital economy and the continuous progress of human civilization, has made a qualitative leap in human lifestyle and social productivity (Wang et al.,2020). The emergence of smartphones is an inevitable product of the development of the information age and digital society. At the same time, smartphones have had a revolutionary impact on the digitalization of the information society. From the initial feature phones that were only used for making calls, they have evolved into digital media and various commercial applications that are now realized in the palm of your hand. The continuous development and evolution of smartphones, while promoting revolutionary changes in human society, has brought unlimited business opportunities and vitality to various mobile phone manufacturers and surrounding industries (Su et al.,2022). How to better grasp the pulse of the digital age, follow the trend of the information age, firmly grasp the development laws of the digital age economy and society, and master the context of emerging business development and the digital economy code. Better promoting the faster and better development of the digital economy and society is a major historical opportunity for mobile phone manufacturers and chip manufacturers in the world economy today, and it is also full of infinite challenges and changes.

The lifeblood of the success of mobile phone manufacturers depends on the chip manufacturers behind them. This logic is beyond doubt. As the engine of the mobile phone industry in the digital age, the process of top chips has become the core technology and the lifeblood of economic and social development that major economies around the world are competing for. Countries around the world are guiding the development and growth of the chip industry from the national policy level through continuous policy guidance and policy support (Forge et al.,2020). Backed by policy support and the trend of the information age, the technical level, innovation ability and price advantage of chip manufacturers are the three main competitive factors in the chip industry. Technological innovation is the lifeblood of the development of modern enterprises, and it is being continuously confirmed by more and more successful companies. Only by mastering technological innovation and constantly building their own technological development advantages and technological barriers can enterprises maintain their leading position in the fierce market competition. This development concept is even more important for the high-tech chip industry. The continuous breakthroughs in chip manufacturing processes and the continuous reduction of chip power consumption have fundamentally affected the performance and experience of smartphones (Ginny et al.,2021). Combined with the fast charging of mobile phone manufacturers, the continuous breakthroughs in battery materials and capacity, the wireless communication industry is experiencing rounds of technological breakthroughs and technological revolutions. These technological innovations and breakthroughs, while changing people's lifestyles, have also brought unlimited business opportunities to ordinary people and various enterprises. How to take the lead in various market segments and continuously break through and adjust the core competitiveness and core values of chip companies through technological innovation is the only way for chip companies to develop.

In the past few decades of the mobile phone chip industry, many precedents have emerged that have achieved success by specializing in various market segments. For example, Transsion Communications has

achieved great success in the African market through low-end markets and consumers, MediaTek has opened up its own sales market through cost-effective feature phones, and Qualcomm has achieved a monopoly in the high-end mobile phone market through its advanced technology level. These historical experiences show that the brand positioning of chip companies themselves is crucial in a specific consumer market at a specific time. In addition, these chip manufacturers are constantly penetrating into more market segments through their own advantages to gain more market share and market occupancy. Only by constantly exploring their product positioning, effectively deploying low, medium and high-end markets, and combining their own brands with continuous breakthroughs and evolution, can chip companies gain a leading position in the ever-changing mobile phone market (Joshi et al.,2021). In the organic combination of continuously improving their own technological innovation advantages and cultivating their own product positioning, corporate costs are a factor that must be considered. In order to increase the company's profit margin, chip and mobile phone companies must consider how to reduce their own costs, which means how to improve the company's costs through effective means while launching core products. The costs here include both product research and development costs, material labor costs, and assembly costs. In today's global economic integration, many companies are taking the path of global development. How to reduce the cost of technological innovation, localize product positioning, and globalize material costs and corporate costs through effective global market deployment is becoming a proposition and development direction that modern companies, especially chip and mobile phone companies, are paying more and more attention to.

While today's technology is developing rapidly, product homogeneity is becoming increasingly serious. While companies are pursuing product innovation, brand influence is equally important (Zahra et al.,2023). Chip manufacturers need to pay special attention to brand personality, which refers to the dissemination of product or brand characteristics, and on this basis, consumers' perception of these characteristics, which is the result of communication between brand managers and consumers. It is important that brand value needs to be unique. Brand personality can reflect the image of the brand user, reflect consumer values, life goals, lifestyles, social status, etc. Brand personality is formed on the basis of contact with consumers, and is a collection and refinement of the personality of brand users. Through corporate technological innovation, we can improve the internal foundation of the enterprise and build the core competitiveness of the enterprise. Relying on effective ways to build brands, maximize brand value, and organically combine brands with corporate innovative technologies through the construction of brand personality, high-tech companies such as chips can be invincible. Through the construction of a global competitive landscape, it is beneficial to the current economic situation of unbalanced regional economic development. Based on cost control in different market environments, we can create a cost competitiveness channel that belongs to the enterprise itself, reduce the development cost of the enterprise, adhere to green development, and adhere to the path of sustainable development (Yang et al.,2021). It is the only way for chip companies to succeed.

Through in-depth analysis of the above dimensions and combined with user feedback analysis, this article aims to provide effective guidance and suggestions for the development and growth of chip companies, from the aspects of product innovation, brand building, and cost competitiveness analysis, for the construction of core competitiveness of chip companies, and to provide some ideas for the development of chip companies in the fierce market environment.

**Objectives of the Study** - This study aimed to analyze the influence of Technology Innovation, Brand Positioning and Cost Competitiveness on mobile chip company's competitive advantage. Specifically, it seeks to describe technology innovation in terms of innovation culture and management, technology transfer and commercialization and research and development; determine the brand positioning in terms of brand assets, brand values, brand personality; determine cost competitiveness in terms of production efficiency, logistics, and innovation efficiency; test the significant relationship between technology innovation, brand positioning and cost competitiveness; develop an enhanced competitive advantage framework that can be used by mobile chip companies.

## 2. Methods

**Research Design** - The researcher takes mixed research design by using both quantitative and qualitative design method in order to identify and emphasize the impact of employee compensation, personal recognition and company rewards on the staff satisfaction improvement in China foreign enterprise management. Qualitative analysis is the analysis of the "quality" of the research object. Specifically, it uses the methods of induction and deduction, analysis and synthesis, and abstraction and generalization to process the various materials obtained, so as to get rid of the dross and select the essence, remove the false and keep the true, from one to the other, from the surface to the inside, to understand the essence of things, reveal inner laws. Quantitative analysis refers to the analysis of the quantitative relationship between the components contained in a research object or the quantitative relationship between the properties it possesses; it can also analyze and compare certain properties, characteristics, and interrelationships of several objects quantitatively, and the results of the research are also used "Quantity" is described. The unity of qualitative analysis and quantitative analysis deeply reflects the inseparable connection between qualitative analysis and quantitative analysis. This inseparable connection depends on the fact that they each reflect different aspects of the same thing, which requires the combination of qualitative analysis and quantitative analysis.

**Participants of the Study** - The participants of this study are the employees of listed company of information and communication company in mainland China. These employees have many things in common about company policies and project engagement. The study used random and purposive sampling which is most useful and practical for the study to avoid biases from the participants. The participants are covering all levels of employees from grassroots executive engineers to senior managers, and including all technical, administrative, human resources, finance, legal affairs, sales, technical support, and project manager positions. The numbers of participants are consist of different level of employees from junior engineer, senior engineer, staff engineer to high level director engineering as well as project management staff across different levels, from different sites of company over 400 employees in China. To ensure the accuracy and consistency of the data samples, all participants in the study are employees who have passed the company's probationary period.

**Data Gathering Instrument** - Two types of instruments will be used. First instrument is a self made instrument through survey of demographic profile of participants in terms of age, gender, working years in company, background education, current titles as well as working teams. The second instrument was adopted from the 3 case studies conducted. Data collection for this study was done by two ways. The first is through the questionnaire survey, based on the selection of the respondents of different age groups, different companies, different positions, different ranks, from the questionnaire listed below. In recent years, foreign companies have attached great importance to the development of the Chinese market and the huge business opportunities brought about by China's reform and opening up. The number of employees in Chinese branches has grown exponentially. More and more foreign giants have established R&D centers or technical support cooperation in China team.

**Table A**

*Reliability Test Result*

Indicators	No. of items	Cronbach Alpha	Remarks
Innovation culture and management	5	0.925	Excellent
Technology transfer and commercialization	5	0.837	Good
Technology research and development	5	0.874	Good
Brand Asset	5	0.933	Excellent
Brand values	5	0.946	Excellent
Brand Personality	5	0.868	Good
Production efficiency	5	0.899	Good
Logistics	5	0.902	Excellent
Innovation efficiency	5	0.922	Excellent

George and Mallery (2003) provide the following rules of thumb: " $> .9$  - Excellent,  $> .8$  - Good,  $> .7$  - Acceptable,  $> .6$  - Questionable,  $> .5$  - Poor, and  $< .5$  - Unacceptable

The questionnaire comprises of 4 parts. Part 1 comprises the demographic data on age, gender, company working years, employee degree information, title and team from Chinese enterprises from different companies. Part 2 comprises of three sub parts including a) Innovation culture and management b) Technology transfer and commercialization and c) Technology research and development which comprises of fifteen (15) survey questions. Part 3 involves a) Brand Asset b) Brand values and c) Brand Personality which has 15 survey questions. Part 4 comprises of 15 survey questions which is targeted to analyze a) Production efficiency, b) logistics and c) Innovation efficiency. All parts are quantitatively measured by using the 4-Likert Scale where 4 as the highest rating and 1 as the lowest rating. Below interpretation is used: Strongly Agree: 1.49 -1.00 (1), Agree: 2.49 -1.50 (2), Disagree: 3.49 -2.50 (3), and Strongly Disagree: 4.00-3.50 (4). A reliability test was conducted to assess the consistency and stability of a measurement instrument, ensuring that it produces dependable and repeatable results over time and under different conditions. The results showed values greater than 0.700, which generally indicates that the measurement instrument has acceptable reliability, it produces consistent and stable results with a moderate to strong degree of dependability.

**Data Gathering Procedure** - The researcher reported and requested the proposed study to local statistical bureau as well as relevant organizations involved for approval in advance. After final approval from relevant organizations the researcher finalized the adopted questionnaire and submitted for the verification process. A verification process was handled with the assistance from the professional research study superior and a professional statistician. After the validation, the researcher raised email to the relevant chipset vendor companies and requested approval to conduct survey from all regular employees. Researchers assured the high manager that confidentiality of respondent data will be respected and observed. Upon getting final approval from top managers, questionnaires were then individually distributed to all participant employees. Questions with any concerns or queries was also explained to respondents to align the targets and plans of the survey for better understanding. Respondents were given additional 5 working days to for the survey questions answering. Finally, collect the survey from each one and tabulate the result.

**Data Analysis** - Weighted mean and rank were used to describe technology innovation in terms of innovation culture and management, technology transfer and commercialization and research and development; to determine the brand positioning in terms of brand assets, brand values, brand personality; and to determine cost competitiveness in terms of production efficiency, logistics, and innovation efficiency. The result of Shapiro-Wilk Test showed that p-values of all variables were less than 0.05 which means that the data set was not normally distributed. Therefore, Spearman rho was used as part of the non-parametric tests to determine the significant relationship. All analyses were performed using SPSS version 28.

**Ethical Consideration** - Researcher ensured that ethical considerations are considered and given high priority throughout the conduct of relevant research investigations. Based on ethical considerations, before conducting any surveys, the researcher sought the consent of the respondents before starting relevant research discussions. At the same time, the respondents were given free will to answer or refuse throughout the process. Respondents were not required to fill in personal information on the questionnaire and answered individual questions anonymously, even if they were known to the researcher. Respondents are also assured that all submitted data will be considered confidential and shall be protected from any harm and disclosure that may inconvenience the Respondent. In addition, the privacy and anonymity of the respondents are strictly protected. The whole process of the questionnaire is conducted in a friendly and voluntary manner.

### 3. Results and discussions

Table 1 presents the summary table of technology innovation. The composite mean is 2.40, which is indicating that the respondents generally agree, thus it is widely recognized by employees in terms of innovation culture and management, research and development as well as research and development, and this may bring positive impact on enterprise structure building of the technology innovation. This indicates that enterprises need to strive to improve their own level in all dimensions of product innovation, actively build the management of

innovation culture system, scientifically deploy the leading role of technological innovation in the production process, and penetrate science, technology and innovation means into all aspects of enterprise development. Enterprises need to absorb the vitality of innovation through internal and external technology transformation, drive the scientific research team to actively participate in innovation activities, and constantly inject new vitality into the scientific and technological innovation of enterprises. It injects diversified goal orientation and value pursuit system into every link of the main body of technological innovation, and forms an effective and efficient coordinated diversified system of scientific and technological innovation. Multiple product innovation subjects in the innovation chain are organically brought together to achieve incentive compatibility.

**Table 1**

*Summary Table of Technology Innovation*

Indicators	Weighted Mean	Verbal Interpretation	Rank
1. Innovation Culture and Management	2.41	Agree	1.5
2. Technology Transfer and Commercialization	2.41	Agree	1.5
3. Research and Development	2.38	Agree	3
Composite Mean	2.40	Agree	

*Legend: 3.50-4.00=Strongly Disagree; 2.50-3.49=Disagree; 1.50-2.49=Agree; 1.00-1.49=Strongly Agree*

The item “Innovation Culture and Management” and “Technology Transfer and Commercialization” are both ranked first with a weighted mean score of 2.41 points, and the verbal explanation is "Agree". This shows that enterprises are relatively more active in the field of innovation culture management and technology transformation and commercialization, but there is still a need for further improvement and improvement. Enterprises need to actively promote the reform of scientific research management system, optimize the effective allocation of scientific and technological resources, promote exchanges and cooperation among innovation entities, and promote the overall layout of industry-university-research-application integration. This can be related to the study of Steil et al.,2021, Establish and improve the enterprise system of scientific research and innovation system, optimize the distribution mechanism of scientific and technological achievements into corporate benefits, let real scientific research and innovation play a leading role in the development of enterprises, deepen the internal reform of scientific and technological innovation resources distribution, allow enterprises and employees to take scientific and technological innovation as the orientation, and actively carry out various forms of medium and long-term innovation incentive programs in their daily scientific research work. Focus on increasing the forward-looking, basic and strategic research layout of scientific and technological innovation, promote the incentive mechanism of scientific and technological talents, and give scientific and technological innovation greater decision-making power of technical routes, more financial support and greater enterprise resource scheduling rights, to ensure that the autonomy and flexibility of scientific and technological innovation are constantly improved.

The item “Research and Development” is generally ranked lowest with a weighted mean score of 2.38 points with the verbal explanation is "Agree". This indicates that the enterprise's scientific and technological innovation research and development results are sufficient, and it is necessary to actively promote the continuous improvement of scientific research level through scientific and effective means, vigorously improve the scientific research evaluation mechanism of all aspects of technological innovation, and take technological innovation as the orientation to ensure that the scientific research level can continuously meet the market demand and bring economic benefits to the development of enterprises. This can be related to the study of Audretsch et al.,2020, through the mechanism evaluation found in this study, it is necessary to deeply analyze the current situation of enterprises in the innovation mechanism. From the perspective of innovation organizational structure, innovation research and development process and optimization of relevant assessment standards, efforts should be made to improve the problems existing at each node of the enterprise's innovation research and development.

**Table 2***Summary Table of Brand Positioning*

Indicators	Weighted Mean	Verbal Interpretation	Rank
1. Brand Assets	2.42	Agree	1
2. Brand Values	2.37	Agree	3
3. Brand Personality	2.39	Agree	2
Composite Mean	2.39	Agree	

*Legend: 3.50-4.00=Strongly Disagree; 2.50-3.49=Disagree; 1.50-2.49=Agree; 1.00-1.49=Strongly Agree*

Table 2 presents the summary table of brand positioning. The composite mean is 2.39, which is indicating that the respondents generally agree. This means that brand positioning aspect is widely recognized by employees in terms of brand assets, brand values and brand personality, and this may bring positive impact on enterprise structure building of the brand positioning. This shows that the brand positioning of enterprises needs to be further improved and optimized through scientific and effective methods. The business communication environment changes strangely, the information explosion, the industry competition is fierce, and the brand is facing unprecedented challenges. Brand positioning is the key to establish emotional connection between brands and consumers. It determines the image and status of the brand in the minds of consumers, and is the basis of brand communication and marketing. A clear and unique brand positioning can enable consumers to identify with the brand, thereby increasing brand loyalty and consumption stickiness. Through market research, enterprises should deeply understand the consumer demand of the target market, clarify the target consumer group, and refine the core value of the brand, so as to determine the brand positioning. According to the study of Situmorang et al.,(2021) and Koch (2020), at this stage, the commercial competition has already become white-hot, various marketing means emerge in an endless stream, and various activities, technology and other issues have also become one aspect of marketing competition. Brand positioning more urgently needs the ability to cope with multi-dimensional environmental changes and withdraw from the vortex of competition in a timely manner. In today's commercial battlefield, the competition between brands is no longer a simple competition between products and prices, but more into brand positioning and strategy. A proper and unique brand positioning can allow enterprises to occupy a place in the fierce business war, and even become the weather-vane leading the market.

“Brand Assets” ranked first with a weighted mean score of 2.42 points, and the verbal explanation is "Agree". This shows that the company is relatively active in the management and maintenance of brand equity. The value of brand equity is not only reflected in the improvement of the enterprise's market share and sales, but also reflected in the enhancement of the enterprise's competitiveness and long-term development potential. The value of brand equity can be measured in a variety of ways. One common approach is to use a brand value assessment model, which takes into account several factors such as a brand's market performance, brand strength, brand image, and so on. In addition, the value of brand equity can be assessed through methods such as consumer surveys and data analysis. For enterprises, brand equity is more important than tangible assets. This can be related to the study of Rego et al.,(2022) the establishment of brand equity is a long and complicated process, which requires enterprises to take a series of effective measures. Through clear brand positioning and target audience, enterprises can better meet the needs of consumers and improve their brand competitiveness, strengthen brand image publicity and brand reputation construction, continuous marketing, establish brand community, constantly innovate and improve the components of brand equity, and constantly consolidate the core value of their brand equity.

The item “Brand Personality” is generally ranked second highest with a weighted mean score of 2.39 points with the verbal explanation is "Agree". And followed by the item ““Brand Values” with the lowest rank with a weighted mean score of 2.37 points. This shows that enterprises need to create a super imprint that can impress consumers deeply, form their own charm and unique competitive advantages in the market, and prove ownership through specific logos, so as to effectively shape the corporate image, expand the market scale of enterprises, and increase corporate earnings. By improving their own brand value, enterprises can also effectively obtain



extended value and added value, so as to obtain more business interests, and bring more benefits to enterprises virtually. This can be related to the study of Tajvidi et al.,(2021), enterprises can shape brand image through the use of value and improve user stickiness through the strong appeal of their own products. Enterprises can also build brand value through emotional appeals, which can also pull the distance between enterprises and consumers. By establishing the core advantages of the brand and seeking breakthrough points, no matter from the aspects of product positioning, packaging design, communication and operation, each enterprise can survive has its own advantages and characteristics, how to find its own advantages and positioning is a problem for enterprises to consider. The significance of brand building for the development of enterprises is also to increase the added value of related products and extend the brand value.

**Table 3**

*Summary Table of Cost Competitiveness*

Indicators	Weighted Mean	Verbal Interpretation	Rank
1. Production Efficiency	2.40	Agree	1
2. Logistics	2.33	Agree	3
3. Innovation Efficiency	2.34	Agree	2
Composite Mean	2.36	Agree	

*Legend: 3.50-4.00=Strongly Disagree; 2.50-3.49=Disagree; 1.50-2.49=Agree; 1.00-1.49=Strongly Agree*

Table 3 presents the summary table of cost competitiveness. The composite mean is 2.36, which is indicating that the respondents generally agree. This means that cost competitiveness aspect is widely recognized by employees in terms of production efficiency, logistics and innovation efficiency, and this may bring positive impact on enterprise structure building of the cost competitiveness. This shows that the cost competitiveness of enterprises needs to be further improved and optimized through scientific and effective methods. Enterprises need to determine clear cost objectives, cost strategies and focus on the direction of effort, the implementation of organizational responsibilities and continuous improvement mechanisms. Managers pay attention to and monitor the implementation, is an important guarantee for the construction of cost competitiveness. Enterprises need to determine clear cost objectives, cost strategies and focus on the direction of effort, the implementation of organizational responsibilities and continuous improvement mechanisms. Managers pay attention to and monitor the implementation, is an important guarantee for the construction of cost competitiveness. Enterprises in the case of similar product quality, through effective ways to ensure that the overall cost is lower than competitors, so as to maintain a competitive advantage in price. Compared with other enterprises that may fall into a loss in the competition, the cost leadership strategy enables enterprises to continue to make profits. According to the study of Adiguzel (2020) in order to improve their cost competitiveness, enterprises can start from various aspects, firmly grasp the cost management of key links such as procurement and sales, logistics and transportation, capital control, energy consumption, and project construction, implement the cost management of the whole value chain and the whole life cycle, and vigorously reduce non-productive expenses. Deepen the cost target management of all employees, standard the industry benchmark and historical optimum, analyze the cost composition in depth, decompose the control target step by step to the smallest responsibility unit, start from small things, and improve the lean management level of the whole value chain, all factors and full cycle costs.

The item "Production Efficiency" is ranked first with a weighted mean score of 2.40 points, and the verbal explanation is "Agree". This shows that the company is relatively active in the management and maintenance of production efficiency. Efficient production management is the key for enterprises to gain competitive advantage. Through scientific and reasonable production process and effective resource allocation, production efficiency can be improved, cost can be reduced, and product quality can be improved. Through rational planning of production process, introduction of advanced production technology and equipment, establishment of standardized management process, application of information management system, and establishment of performance evaluation system, enterprises can improve production management efficiency, achieve high-quality and efficient production, and win the advantage of market competition. This can be related to the study of Padilla-Lozano (2022) production is a process of continuous improvement. Enterprises should establish a sense

of innovation, and constantly improve production technology, production process and management mode, in order to continue to improve production efficiency and reduce production costs. In short, improving production efficiency and reducing production costs is a comprehensive work that requires enterprises to take measures from all aspects.

The item “Innovation Efficiency” is generally ranked second highest with a weighted mean score of 2.34 points with the verbal explanation is "Agree". And followed by the item “Logistics” with the lowest rank with a weighted mean score of 2.33 points. This shows that enterprises need to reduce logistics costs through effective means, including scientific and reasonable measures to reduce energy consumption, establish a sound energy-saving management system, advocate sustainable development strategy, strengthen inventory management level, adopt advanced inventory management methods, and accelerate the transformation and upgrading of enterprises' digital strategy. This can be related to the study of Nechaev et al.,(2021) for a semiconductor company, it is the process of managing the flow of goods, data and money associated with a product or service, from the purchase of raw materials to the delivery of the product to its final destination. Among them, the cost of logistics includes warehousing cost plus transportation cost and the cost of product management. In order to better manage the inventory situation, ERP system can be introduced. Through the ERP management system, it can realize the active early warning of abnormal inventory conditions, and the system can output multi-dimensional inventory status analysis data in real time. For semiconductor companies, if product technology is the first competitiveness, then supply chain management including logistics is the second competitiveness. The management of all aspects of the semiconductor industry is developing in the direction of intelligence and digitalization, and the data management of semiconductor products is becoming more and more important.

**Table 4**

*Relationship Between Technology Innovation and Brand Positioning*

Variables	rho-value	p-value	Interpretation
<b>Innovation Culture and Management</b>			
Brand Assets	.380**	<.001	Highly Significant
Brand Values	.437**	<.001	Highly Significant
Brand Personality	.438**	<.001	Highly Significant
<b>Technology Transfer and Commercialization</b>			
Brand Assets	.397**	<.001	Highly Significant
Brand Values	.408**	<.001	Highly Significant
Brand Personality	.406**	<.001	Highly Significant
<b>Research and Development</b>			
Brand Assets	.360**	<.001	Highly Significant
Brand Values	.447**	<.001	Highly Significant
Brand Personality	.351**	<.001	Highly Significant

*Legend: Significant at p-value<0.01*

Table 4 presents the relationship between technology innovation and brand positioning, showing a weak to moderate direct correlation across various variables. For Innovation Culture and Management, there are highly significant correlations with Brand Assets (rho = .380, p < .001), Brand Values (rho = .437, p < .001), and Brand Personality (rho = .438, p < .001). This suggests that a strong innovation culture is positively associated with better brand positioning across all three brand-related variables. Similarly, Technology Transfer and Commercialization show highly significant correlations with Brand Assets (rho = .397, p < .001), Brand Values (rho = .408, p < .001), and Brand Personality (rho = .406, p < .001), indicating that effective commercialization of technology positively influences brand positioning. Finally, Research and Development also has highly significant correlations with Brand Assets (rho = .360, p < .001), Brand Values (rho = .447, p < .001), and Brand Personality (rho = .351, p < .001). This suggests that robust R&D efforts contribute significantly to strengthening brand attributes, particularly brand values.

**Table 5***Relationship Between Technology Innovation and Cost Competitiveness*

Variables	rho-value	p-value	Interpretation
<b>Innovation Culture and Management</b>			
Production Efficiency	.399**	<.001	Highly Significant
Logistics	.446**	<.001	Highly Significant
Innovation Efficiency	.409**	<.001	Highly Significant
<b>Technology Transfer and Commercialization</b>			
Production Efficiency	.408**	<.001	Highly Significant
Logistics	.387**	<.001	Highly Significant
Innovation Efficiency	.412**	<.001	Highly Significant
<b>Research and Development</b>			
Production Efficiency	.385**	<.001	Highly Significant
Logistics	.278**	<.001	Highly Significant
Innovation Efficiency	.332**	<.001	Highly Significant

Legend: Significant at  $p\text{-value} < 0.01$

Table 5 examines the relationship between technology innovation and cost competitiveness, revealing significant positive correlations across various variables. Innovation Culture and Management shows highly significant correlations with Production Efficiency ( $\rho = .399$ ,  $p < .001$ ), Logistics ( $\rho = .446$ ,  $p < .001$ ), and Innovation Efficiency ( $\rho = .409$ ,  $p < .001$ ). This indicates that fostering a strong innovation culture positively impacts cost competitiveness, particularly in terms of improving production processes, logistical operations, and innovation outcomes. Technology Transfer and Commercialization also demonstrates highly significant relationships with Production Efficiency ( $\rho = .408$ ,  $p < .001$ ), Logistics ( $\rho = .387$ ,  $p < .001$ ), and Innovation Efficiency ( $\rho = .412$ ,  $p < .001$ ). This suggests that successfully transferring and commercializing technology leads to better performance in production and logistics, as well as enhancing innovation efficiency. Research and Development shows slightly weaker but still highly significant correlations with Production Efficiency ( $\rho = .385$ ,  $p < .001$ ), Logistics ( $\rho = .278$ ,  $p < .001$ ), and Innovation Efficiency ( $\rho = .332$ ,  $p < .001$ ). Although the impact of R&D on logistics is somewhat lower compared to other variables, R&D still contributes meaningfully to improving cost competitiveness.

**Table 6***Relationship Between Brand Positioning and Cost Competitiveness*

Variables	rho-value	p-value	Interpretation
<b>Brand Assets</b>			
Production Efficiency	.320**	<.001	Highly Significant
Logistics	.341**	<.001	Highly Significant
Innovation Efficiency	.328**	<.001	Highly Significant
<b>Brand Values</b>			
Production Efficiency	.414**	<.001	Highly Significant
Logistics	.404**	<.001	Highly Significant
Innovation Efficiency	.440**	<.001	Highly Significant
<b>Brand Personality</b>			
Production Efficiency	.399**	<.001	Highly Significant
Logistics	.386**	<.001	Highly Significant
Innovation Efficiency	.363**	<.001	Highly Significant

Legend: Significant at  $p\text{-value} < 0.01$

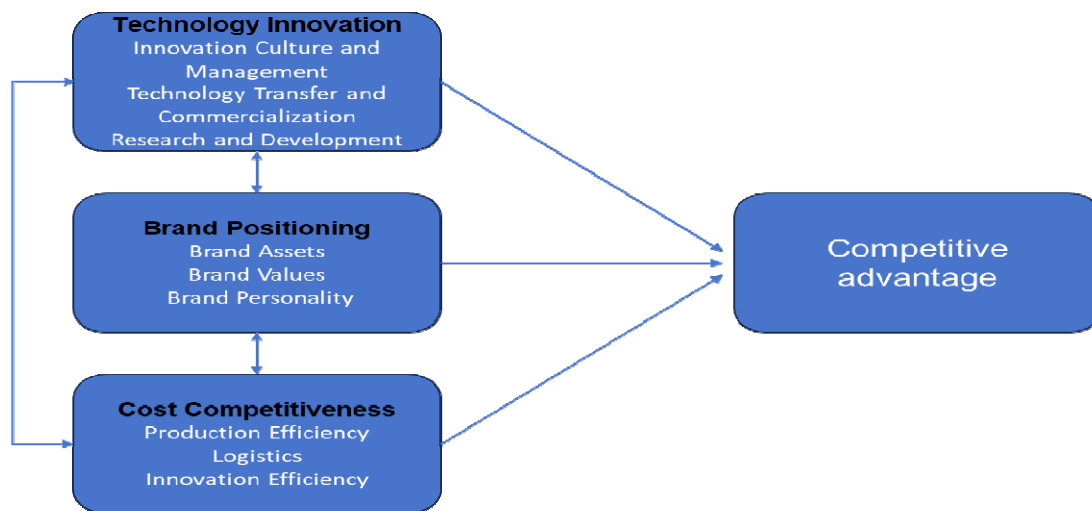
Table 6 explores the relationship between brand positioning and cost competitiveness, showing significant positive correlations across several brand and cost-related variables. Brand Assets have highly significant correlations with Production Efficiency ( $\rho = .320$ ,  $p < .001$ ), Logistics ( $\rho = .341$ ,  $p < .001$ ), and Innovation Efficiency ( $\rho = .328$ ,  $p < .001$ ). This indicates that stronger brand assets, such as a company's reputation and equity, contribute positively to cost competitiveness, improving production, logistics, and innovation-related outcomes. Brand Values show even stronger correlations with Production Efficiency ( $\rho = .414$ ,  $p < .001$ ), Logistics ( $\rho = .404$ ,  $p < .001$ ), and Innovation Efficiency ( $\rho = .440$ ,  $p < .001$ ). This suggests that aligning the brand with strong values significantly enhances a company's ability to maintain cost-efficient operations,

particularly in terms of driving production efficiency and fostering innovation. Brand Personality also exhibits highly significant relationships with Production Efficiency ( $\rho = .399, p < .001$ ), Logistics ( $\rho = .386, p < .001$ ), and Innovation Efficiency ( $\rho = .363, p < .001$ ). A distinctive and well-defined brand personality helps improve cost competitiveness, particularly through more efficient production and logistical operations.

*Framework of Competitive Advantage*

Through the analysis and statistics of three variables, namely technological innovation, brand positioning and cost competitiveness, this paper comprehensively evaluates the competitive advantages of mobile chip company in various dimensions. Through in-depth analysis of the three typical dimensions of each typical variable, the paper aims to make corresponding analysis and suggestions for the current challenges faced by mobile chip enterprises, and provide guidance and suggestions for enterprises to maintain sustainable competitiveness in the complex market competition.

The above diagram illustrates how strengthening three key areas can bring competitive advantage leadership within an enterprise. It emphasizes the importance of technology innovation, brand positioning and cost competitiveness for a chip company. By enhancing these areas, company can improve technical skills, AI, modern management system into each sub-area. This integrated approach can lead to greater competitive with regard to more profits, lower cost and higher brand reputation to get company better and better.



*Figure 1: Framework of Competitive Advantage*

**4. Conclusions and recommendations**

Respondents moderately agree with the efforts and achievement on the technological innovation including innovation culture and management, technology transfer and commercialization, research and development. Respondents moderately agree with the efforts and achievement on the brand positioning including brand assets, brand values, and brand personality. Respondents moderately agree with the efforts and achievement on the cost competitiveness including production efficiency, logistics, and innovation efficiency. There is highly significant relationship among technological innovation, brand positioning and cost competitiveness. An enhanced competitive advantage framework was developed that can be applied in chip mobile company.

The mobile chip companies may integrate a cross-functional review committee and data-driven tools to ensure Research and Development project prioritization aligns with strategic goals and market needs. The companies may invest in continuous market analysis and employee upskilling programs to sustain innovation and maintain its competitive edge in cutting-edge technology. The companies may establish strong relationships with suppliers and implement a supplier performance evaluation system to maximize negotiation leverage and ensure consistent quality and supply. The mobile chip companies may use the enhanced competitive advantage framework to improve its performance. Future researcher may explore the framework's applicability in other industries and incorporate emerging factors like sustainability and digital transformation to broaden its relevance.

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