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BUYING BEHAVIOR OF ASSEMBLY & TEST SERVICE DECISION MAKER OF LOCAL IC DESIGN HOUSES

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Abstract

China is developing rapidly in strategic emerging industries represented by smart phones, Internet of Things, artificial intelligence, storage, and new energy vehicles. And the urgent need for localization of the industrial chain, as well as the increasing number of Local IC design houses, and the rapid growth of annual sales revenue. These have prompted OSAT to regard Local IC design house as an important customer group. Therefore, this article is based on the relevant literature and interviews, based on the Theory of Planned Behavior, combined with the characteristics of the Local IC design house and assembly & test OSAT industry. Construct a theoretical model of purchase behavior and questionnaires, with brand trust, customer orientation, behavior attitude, subjective norms, perception behavior control and buying intention as dimensions. This shows that brand trust has a significant positive impact on customer orientation. In the same way, it is concluded that brand trust has a significant positive influence on behavior attitude, subjective norms, perception behavior control, buying intention and purchase behavior. Second, after descriptive analysis of customer orientation, the SEM structural equation model is used to observe the model regression between customer orientation and various variables. When it comes to the influence of customer orientation on behavior and attitude, this path does not show significant, indicating that customer orientation does not affect behavior and attitude. In the same way, it is concluded that when customer orientation affects subjective norms, perception behavior control, and buying behavior, it is concluded that customer orientation will have a significant positive influence on subjective norms and buying behavior. And it does not have a significant positive influence on the control of perceived behavior. Third, purchase behavior. A descriptive comparative analysis of Local IC design house buying intentions according to the nature of the company, registration place and product application. According to the regression coefficient of the purchase behavior model, when brand trust has an impact on buying intention, the standardized path coefficient value is $0.189 > 0$, and this path exhibits significance at the 0.05 level. It shows that brand trust has a significant

positive influence on buying intention. (1) In the study of buying behavior, regular communication with customers on technical capabilities, fulfilling service promises, and ability to deal with abnormal problems, etc., make regular updates of the progress so that customers have an increased grasp of the factual progress of OSAT, thereby achieving an increase in trust. (2) OSAT focuses on existing customers, or through the correct guidance of end customers, publicity meetings, etc., to let local customers perceive the core points of assembly & test OSAT's quality, price, service, delivery, and engineering support. To increase buying intention and purchase behavior. (3) Attitude, packaging, and testing OSAT meets the needs of end customers and can provide free design, simulation, logistics and other services. (4) In perceptual behavior control, OSAT for assembly & test can give local chip companies preferential policies for assembly & test service fees, and low investment policies when the project is introduced in the early stage. This eliminates customers' worries and enhances customers' willingness to buy. (5) Customer-oriented analysis, planning to communicate and communicate with end customers regularly in the form of quarterly technical exchanges. From the promotion advantages of product quality, technology, delivery time, etc., increase the recognition and recognition of end customers, and gradually become one of the assembly & test suppliers certified by end customers.

Keywords: Brand Trust, Customer Orientation, Theory of Planned Behavior, Buying intention, Buying Behavior

Introduction

The "Market Depth and Competitive Strategy Analysis Report of China's Chip Design Industry for 2020-2026" released by Zhiyan Consulting shows: In 2011, China's IC design sales revenue was 52.64 billion yuan, and by 2019, China's IC design sales revenue was 306.35 billion yuan. Compared with the compound growth rate of 59.2% in 2011, judging from the increase in the number of chip design companies from 2010 to 2019, there are 1,780 design companies nationwide, which is 1,246 more than 534 in 2011, and the number has increased by 233%. In addition to traditional design companies such as Beijing, Shanghai and Shenzhen, there are more than 100 design companies in cities such as Wuxi, Hangzhou, Xi'an, Chengdu, Nanjing, Suzhou, and Hefei. According to data from IC Insights, an authoritative third-party research organization for semiconductors, among the world's top 50 IC design houses, mainland China accounts for 13%, ranking third in the world. Compared with 2010, China's market share has risen by 8%, making it the fastest growing country. The Chinese government established the China Integrated Circuit Industry Investment Fund (CICIIF) in September 2014. It is envisaged to spend more than 150 billion US dollars in the next 10 years to accelerate the development of integrated circuit design and manufacturing. (Kusiak, 2020; Voynarenko et al., 2020)

With the support of the Chinese government, the integrated circuit industry in mainland China has gradually emerged after more than ten years of accumulation. Internationally renowned

leading companies such as HiSilicon, Spreadtrum, ZTE Microelectronics, SMIC, and Changjiang Electronics Technology have been born, and China's semiconductor industry chain has initially formed. As the technical core of the semiconductor industry chain, the local IC design house in China, its rapid growth has played a positive role in promoting the development of China's semiconductor industry. At the same time, the rapid growth of chip design companies will increase the frequency and quantity of wafer processing and buying behavior of China's assembly & test services and expand the customer base of wafer factories and assembly & test OSAT. Obviously, it has become an important guarantee for the growth of OSAT revenues for various FABs and assembly & test. Secondly, China has achieved breakthrough rapid growth in the fields of smart phones, storage, artificial intelligence, security monitoring, and the Internet of Things. Increasing the Sino-US trade friction has accelerated the demand for localized procurement of chips by Chinese companies. China's semiconductor industry policy issued as early as May 2015 proposed the goal of accelerating the development of the semiconductor industry and reducing dependence on IC chip imports. The specific target proposes that China's IC chip self-sufficiency rate will reach 40% by 2020 and 70% by 2025. This article is based on the research background of Local IC design house's buying behavior of China's assembly & test services: (1) Under the external environment, the number of local IC design houses in China has been increasing, and the annual sales revenue has increased rapidly. And the Chinese semiconductor industry chain formed under the national support policy has prompted OSAT for assembly & test to regard the local IC design house as an important customer group. (2) China assembly & test OSAT customer base structure has changed from the original European and American customers and the complementary situation of Asia-Pacific customers to a tripartite structure, which has become an important component of the growth of assembly & test performance. (3) China's rapid development of strategic emerging industries represented by smartphones, Internet of Things, artificial intelligence, storage, and new energy vehicles, as well as the urgent need for localization of the industrial chain, have quickly promoted the growth of local chip design companies and assembly & test companies. The above has important practical significance for this article to study the buying behavior of local IC design house in assembly & test OSAT. (4) From the analysis of academic research, there is little research on buying behavior in the semiconductor industry. The research on buying behavior of Chinese assembly & test services by chip design companies is even more blank. This adds to the theoretical significance of this paper.

Problem Statement

With the continuous increase in the number of local customers, the rapid growth of annual sales revenue and localization demand, the frequency and quantity of purchases by local customers of China's assembly & test services have been accelerated. At the same time, China's packaging, and testing OSAT is also aimed at the future market size, and fierce competition has been formed between the assembly & test OSATs. This kind of competition comes from China assembly & test OSAT. At the same time, the foreign assembly & test OSAT also regards the local IC design

house as an important source of its future business growth. Therefore, for assembly & test OSAT, it is of great significance to study the buying intention of the local IC design house and the buying action after the intention is formed. The research on buying behavior is usually based on the Theory of Planned Behavior, although the research on buying behavior under the Theory of Planned Behavior has been applied to many industries. However, the author consulted and read the existing literature, and the relevant materials of the research on the buying behavior of China's assembly & test services by the local IC design house are basically in the research blank. The research in this paper intends to fill a gap in the research on China's assembly & test service buying behavior based on the Theory of Planned Behavior and the recognition of local IC design houses. This article innovates to increase the research blanks on buying behavior of the two independent variables of Brand Trust and Customer orientation. In summary, the questions of this article will revolve around: (1) Under the TPB theoretical model, the role of Brand Trust in the purchase of Chinese assembly & test services by a local IC design house and empirical verification. (2) Under the theoretical model of TPB, the role of customer orientation in the purchase of China's assembly & test services by a local IC design house and empirical verification. (3) Local IC design house's empirical study on China's buying behavior of assembly & test services and its influencing factors. (4) An empirical study of local IC design house's buying intention for assembly & test services in China and its role. (Panuju et al, 2020; Gorback & Keys, 2020)

LITERATURE REVIEW

This chapter first distinguishes and explains the definition of related concepts and provides detailed explanations and distinctions for the concepts of local IC design house, assembly & test OSAT companies, and outsourcing for Chinese assembly & test services. Then it analyzes the classic models of buying intention and buying behavior. The focus is on the Theory of Planned Behavior that is commonly used in the study of the buying behavior of local IC design houses for assembly & test services in china. and further analyze from the behavior attitude, subjective norm, perception behavior control, and buying intention subdivided by Theory of Planned Behavior. Derived brand trust, customer orientation and its influencing factors, consumer buying intention, consumer buying behavior and its influencing factors, etc., combed and reviewed relevant domestic and foreign literature research. And to determine the content of this research, the research framework adopted, and the applied management theory. (Baglioni et al., 2020; Sannon et al., 2020)

Local IC design house

Local IC design house, also known as Fabless. Pure design, the company does not have a wafer factory. Such as the local "Hisilicon" and other chip design companies. The chip design company is directly involved in the whole process from the initial specification design of the chip to the

final chip production and delivery. After decades of development, the semiconductor industry has gradually become an industrial cluster with a clear division of labor and a high degree of specialization. The upstream is mainly suppliers and industry supporters, the midstream is for semiconductor design, chip manufacturing, product marketing, etc., and the downstream manufacturers are outsourcing manufacturers such as assembly & test. And chip design companies, that is, customers have their own finished product brands, but they do not own manufacturing lines. All production processes are completed by their cooperating foundry to complete the entire production and manufacturing process, achieve delivery and shipment, and then enter the sales mode. Typical companies include foreign Qualcomm and domestic "Hisilicon" and "Spreadtrum". The assembly & test OSAT in this article are to complete the assembly & test services from manufacturing to shipment for the chips of the local IC design house.

Assembly & test OSAT

The assembly & test plant is also an enterprise that performs OEM assembly & test for design companies or design service companies. That is, one of the suppliers of the local IC design house, but it does not own its own products. Packaging mainly completes the back-end processes of manufacturing, and then ships to the next supplier. The testing process is to use an automatic test machine to test the electrical performance of the packaged chip according to the written program to obtain the final good product, and ship it to the chip design company or directly to the customer according to the design company's requirements. Companies in this type of supply chain include ASE and domestic Changdian Electronics Technology.

Outsourced assembly and testing services

The main mode of Outsourced Assembly and Testing is to provide chip design companies with assembly & test services in China. The idea of outsourcing stems from the belief that centralized production can promote cost reduction and technology improvement. And this idea has been verified in the actual operation of the chip company, and it is concluded that whether it is in terms of scale, production efficiency, operation process, technical support, especially financial support, assembly & test, and even wafer processing are outsourced. It is more suitable for the development plan of the enterprise. With the continuous segmentation of the industry, the enhancement of specialization, the diversification of product types, and the increasing development costs, companies are all urged to find outsourcing business models. In recent years, the rapid growth of local IC design houses has accelerated the control of chip prices in the industry. Therefore, more and more chip companies, including IDM companies, have successively adopted the business model of outsourcing assembly & test services in China.

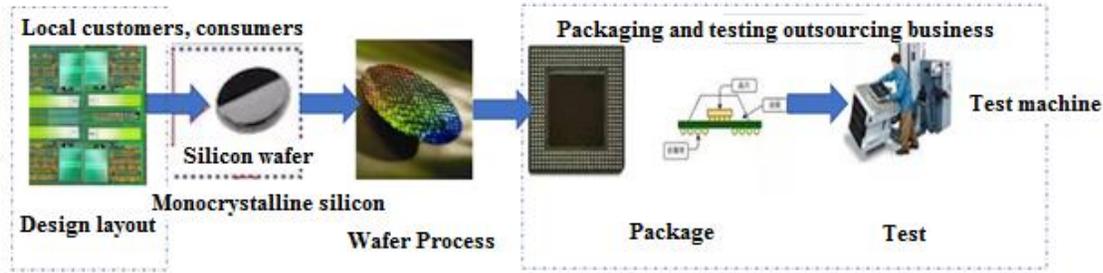


Figure 2-1 Flow chart of chip design companies and assembly & test OSAT

Purchase decision maker

Webster and Wind said that organizing buying is the identification of various types of formal organizations between available brands and suppliers to determine the needs of purchasing products and services. The decision-making unit of a purchasing organization is the purchasing center, which refers to all individuals and collectives participating in the purchasing decision-making process. They have a certain common goal and jointly assume various risks caused by the decision. In the purchase decision process, each participant has personal motives, intuitions, and preferences. These factors are affected by the personality of the decision participant and the risk awareness and culture. And this organization usually includes several participants with different interests, powers, status, demeanor, and persuasiveness. In the local IC design house assembly & test service procurement decision maker (department), based on the existing business operation model. Usually it is the engineering department, quality department, purchasing and operation department, senior company management, etc. Therefore, in this study, the above four departments are used as purchase decision makers to study the buying behavior.

Theoretical Literature

To complete the literature review of this dissertation, the author uses the database literature search work. Take "Theory of Planned Behavior", "Behavior Attitude", "Buying intention", "Buying Behavior", "Brand Trust", "Customer Orientation", etc. as keywords. From several major index databases SCI, SSCI, EI, Baidu Academic, CNKI and other databases, we searched scholars' research on buying intention and buying behavior. And the application of the "Theory of Planned Behavior" basis in different application fields, and more than 300 journal articles published in the interdisciplinary field in the past 5 years. After careful consideration and selection, the number of core reference articles was finally reduced by 150. The Theory of Planned Behavior is widely used in research in China. Including low-carbon travel willingness, green consumption behavior, environmental protection willingness, willingness to pay for energy conservation, genetically modified food, clothing purchase, knowledge sharing, tourism, organic green vegetables, etc. Most of these documents are published in core journals and important forums. The contents of these journals and conferences are non-profit commercial such as

government reports, so the authenticity and reliability are strong. At the same time, this article also makes extensive reference to the academic research of foreign researchers to ensure the integrity of the literature.

In this dissertation, the theory of planned behavior and the mode of consumer buying behavior will be regarded as management theories. Documents based on brand trust, customer orientation, and behavior attitude, subjective norm, perception behavior control, and buying intention under the Theory of Planned Behavior.

Dependent variable: Definition of buying behavior and previous research

Buying behavior refers to the various behaviors presented by buyers in the activities and processes of purchasing goods or services. According to the research of Jagdish N. Shenth and Banwari Mittal (2004), the psychological and actual activities taken by families and businesses that can lead to their decision or payment, purchase and use of products and services are Buying Behavior. Foreign researchers' research on buying behavior has been applied in various fields. Steinhauser Johann; Janssen Meike; Hamm Ulrich (2019). Innovative research on the decision-making of buying behavior. Studies have shown that nutritional knowledge and health motivation influence the purchase of products with nutritional and health appeals. The lower the price, the more people feel about the health and deliciousness of the product, the more likely it is to be purchased, and the higher nutritional knowledge or higher health motivation will pay attention to nutrition and health claims for longer. Lucia Madleňáková; Stanislava Turská; Radovan Madleňák (2019). Research shows that image evaluation is an important attribute reflecting the buying behavior of customers in the postal market, and postal corporate image is composed of several factors. The results of this study using factor analysis will enable the postal company to determine its priorities for building a positive image in terms of customer buying behavior. Abosede Ijabadeniyi; Jeevarathnam Parthasarathy Govender (2019). Research has found that the relationship between customer value and buying behavior is regulated by the realization of legal expectations of CSR (a major corrective tool). The realization of ethical and economic corporate social responsibility expectations (a secondary remedial tool) is the moderator of the relationship. Tahir Islam; Jiuchang Wei; Zaryab Sheikh; Zahid Hameed; Rauf I. Azam (2017). The study explored the mediating role of materialism between situational factors and compulsive buying. The data comes from 219 Pakistani university students who used Partial Least Squares (PLS) to analyze the data. This study confirmed an intuition. That is, young people who are more material-conscious are more likely to participate in compulsive buying than young people who are less material-conscious. This result shows that this is also applicable to modern Islamic society. The research results show that materialism mediates the relationship between certain social factors (such as groups, media celebrity endorsements, TV advertisements) and compulsive buying. This study emphasizes the importance of young people's material attitudes and purchasing decisions, and provides critical knowledge for researchers, policy makers and managers of leading brands. Influencing factors in the organizational market buying behavior

include: Environmental factors, including economic prospects, market demand levels, technological development, market competition, political situations, etc. Organizational factors, including organizational goals, strategies, policies, organizational structure, and institutional systems. Personnel factors, personnel relations factors within the organization. Personal factors, such as the age, education level, personality, preference, risk awareness and other factors of the persons involved in the purchase process. Based on what Webster and Wind pointed out, the buying behavior of all organizations is a personal behavior based on organized mutual influence. Because only individuals can identify problems, make decisions, and take actions. At the same time, all buying behaviors are motivated by the personal "needs" and wishes of specific purchasers; personal "needs" and wishes are guided by personal feelings and experiences. And personal feelings and experience are obtained in the complex relationship of achieving corporate goals. Therefore, the goal of marketing must be each decision participant, not an abstract enterprise organization. Understanding the personalities and preferences of each member of the procurement core, and handling the relationship with them, will help the development of marketing business. Therefore, this research will focus on the personal factors in corporate purchasing, namely, the buying behavior of various decision-making participants in the corporate.

Table 2-1 Research on buying behavior of foreign researchers

Researcher/Time	Research shows
Steinhauser Johann; Janssen Meike; Hamm Ulrich; (2019)	Studies have shown that nutritional knowledge and health motivation affect the purchase of products with nutritional and health appeals. The lower the price, the higher people's perception of the health and taste of the product, and the more likely it is to be purchased. People with higher nutritional knowledge or higher health motivation pay longer attention to nutrition and health claims.
Lucia Stanislava Turská; Madleňák; Radovan Madleňák (2019)	Research shows that image evaluation is an important attribute reflecting the purchase behavior of customers in the postal market, and the postal corporate image is composed of several factors. The results of this study using factor analysis will enable the postal company to determine its priorities for building a positive image in terms of customer buying behavior.
Abosede Jeevarathnam Govender (2019)	The relationship between the customer's sense of value and buying behavior is regulated by the realization of legal expectations of CSR (a major corrective tool), and the realization of moral and economic corporate social responsibility expectations (a secondary remedial tool) is related Moderator

Tahir Islam; Jiuchang Wei;
Zaryab Sheikh; Zahid
Hameed; Rauf I. Azam;
(2017)

The research explored the mediating role of materialism between situational factors and compulsive buying, and materialism mediates the relationship between certain social factors and compulsive buying. This study emphasizes the importance of understanding young people's material attitudes and purchasing decisions, and provides key knowledge for researchers, policy makers and managers of leading brands

For the research on buying behavior, Chinese researcher Liu Yang (2010) believes that the personal factors of buying behavior are mainly attitudes, emotions, and perceived risks. Attitude plays an important role in the judgment and decision-making of product quality, payment method, purchase volume, etc. Liu Meilian (2005) believes that preference conflicts will affect shopping decisions in many ways. When facing preference conflicts, they will choose a trade-off point to maximize their utility in the purchase process. Individuals, governments, and companies will be restricted by psychological factors in the process of demand stimulation, information collection, comparative evaluation, etc., and then have different effects on decision-making. Ziyin Gao (2019) published a study on the buying intention and behavior of college students' daily necessities, which showed that to a large extent college student are affected by a series of external and internal influences. Including online and offline impact. Research the offline brand purchase mode of college students in the daily necessities store on campus. Through four dimensions, namely social and cultural background determinants, personal demographic factors, objective characteristics of products and contextual influences, these factors indicate that product suppliers should develop marketing methods with multi-dimensional strategies to achieve customer satisfaction and self-reinforcing brand purpose. Qihua Liu; Xiaoyu Zhang; Shan Huang; Liyi Zhang; Yang Zhao (2019) article uses the empirical analysis of consumer survey data after Double 11 promotion to test the research model. The results show that: The time-l distance has a positive effect on the purchase decision of high-frequency products, while it has a negative effect on the purchase decision of low-frequency products. Social distance has a negative impact on purchasing decisions, and time distance is positively correlated with involvement in purchasing decisions. Fengmei Yi (2019) studied the factors that affect the buying behavior of green agricultural products. The understanding and cognition of green agricultural products and whether marketing factors affect their buying behavior. Green awareness, channel convenience and product brand awareness have a positive impact on buying behavior. The price has a negative impact on buying behavior. Finally, it is pointed out that agricultural products companies can use price, channel and brand marketing strategies to stimulate consumers' green consumption. (Melović et al., 2020, Hossain & Rahman, 2020)

METHODOLOGY

The methodology of this chapter is a combination of qualitative and quantitative research. Clarify the research design, research samples and objects, data collection process, data analysis methods, and schedule for the implementation of questionnaires. Qualitative research mainly includes literature research and theoretical exploration, combined with work experience, and organize personal interviews. Draw up the key test items of the questionnaire and formulate relevant measurement indicators. Quantitative research is a questionnaire survey. Through predictive survey and filtering, the final survey questionnaire is formed after the evaluation and analysis of the preliminary survey questionnaire prediction with SPSSAU software.

Research Design

The research design of this paper includes: the design of questionnaire measurement items, the formation of questionnaire prediction and the method of final questionnaire formation.

Design of survey items

Based on the Theory of Planned Behavior, the research on local IC design house's purchase behavior of assembly & test services in China tends to be blank. Therefore, this study can only refer to and learn from the research results of previous scholars and literature research to complete the development of the scale, and it is difficult to completely use the existing scale in this study. Based on the above, the design of the questionnaire test project follows two points: through interviews with the main persons in charge of the key departments of the chip design company, the keywords that are used frequently are extracted, and the classification and analysis are carried out to determine the initial items of the scale. Supplementing and perfecting, these extracted words and sentences will provide important reference and basis for the exploration of the scale of brand trust and buying behavior in this research. Second, refer to and use the research results and literature surveys of previous scholars as references, combined with industry background, to complete the development of the scale. Based on previous literature and scholars' research, the dimensions of the variables and the items measured in this study are summarized. The idea and method of scale development will follow the steps below to complete the development of local IC design house's scale for assembly & test services in China. First, through literature search and review, interviews with practitioners, combined with the author's actual work experience, clarify the dimensional composition of Local IC design house's purchase behavior of assembly & test services in China. The second draws on the classic scales in different research backgrounds in the past, such as Hess (1995) special brand trust scale. Patricia Gurviez, Michagl Korchia (2003) proposed 8 items for measuring brand trust. Market orientation includes the customer oriented MKTOR scale and the test item scale related to attitudes, subjective norms, and perception behavior control in the Theory of Planned Behavior. Combining the characteristics of local IC design house and assembly & test OSAT industry, the predictive scale of this research is determined. And through a small sample to verify the rationality of the scale, screen out unreasonable items, modify the unreasonable test items proposed in the initial test. The third step is to use the filtered item test scale as the formal

questionnaire test item of this research, formally investigate many samples, and then test the reliability and validity of the formal scale, and finally form a measurement scale.

3.1.1.1 Personal interview content extraction

This research summarizes and summarizes the research on brand trust and related fields. It draws on the classic scales and items of multiple empirical studies such as brand trust and customer orientation as references. However, due to the influence of various factors in the same industry background, it is difficult for this study to completely rely on the research results and literature research of previous scholars to complete the development of the scale. Therefore, the use of qualitative research methods such as content analysis methods, through interviews with the main persons in charge of the key departments of the chip design company, extract keywords that are frequently used. The classification and analysis are carried out to supplement and improve the initial items of the scale. As listed in the table, the high-frequency sub-words and sentences after the analysis of the personal interview content are not listed. These extracted words and sentences will provide important reference and basis for the exploration of the scale of brand trust and purchase behavior in this research.

Table 3-1 Summary of personal interview keywords

Key words	Classification	Frequency of occurrence
Engineering technical ability	Ability	18
Product delivery	Ability	14
Exception handling	Ability	20
High quality strength	Ability	15
Compensation ability	Sense of responsibility	14
honest and reliable	Sense of responsibility	16
Reliability	Product	14
Quality Awareness	Quality	15
Terminal demand	Customer orientation	13
New product introduction designation	Customer orientation	13

Relationship maintenance	Customer orientation	19
Purchase frequency	buying behavior	15
Purchase ratio	buying behavior	20
Additional services (logistics, design)	Satisfaction	18
Priority purchase	Attitude	17
Recommend colleagues etc.	Will	16
Price	Perceived behavior	17

3.1.1.2 Sources of brand trust scale items

Brand trust research originated from the research of foreign scholars. Larzelere and Huston (1980) developed a single-dimensional trust scale when studying interpersonal trust, which included reliability, integrity, and confidence. And Fournier (1994) summarized brand trust as a dimension when studying the relationship framework between brands and consumers, that is, the degree of consumer confidence in relying on the brand. Until 1998, Erden, T. and Swait J. (1998) believed that brand trust has two dimensions. One is trustworthiness that is, the brand's willingness to fulfill its promises, and the other is expertise. In addition, many scholars have proposed different scale measures for brand trust. For example, a special brand trust scale proposed by Hess (1995) includes a three-dimensional structure such as sincerity, altruism, and reliability. Geok Theng Lau (1999) and others believe that brand trust includes three dimensions: brand reputation, brand predictability and brand ability. Arjun Chaudhuri (2001) and others believe that brand trust includes three dimensions: credibility, safety, and honesty. Patricia Gurviez (2003) and others proposed that brand trust is a psychological variable, which includes ability hypothesis, functional expectation, and good deeds hypothesis. Elena Delgado Ballester (2003) proposed another eight items to measure brand trust. Combined with the industry characteristics of China's assembly & test services, the test items in this article are as follows.

Table 3-2 Brand trust test items

Research variables	Code	Measurement items	Source
Brand Capacity Trust	BCT1	I think China's assembly & test OSAT can achieve all its claimed technical capabilities.	Patricia Gurviez(2003)

BCT	BCT2	I think China's assembly & test OSAT Erden, T.& Swait can fulfill its service promise. J. (1998)
	BCT3	If there is a quality problem in the assembly & test service, I think Geok Theng Lau China's assembly & test OSAT can fulfill the relevant problems well. (1999)
	BCT4	Based on experience, I believe that China's assembly & test OSAT has the Arjun Chaudhuri comprehensive strength to maintain a high level. (2001)
Brand Responsibility Trust	BRT1	I know that China assembly & test OSAT is an OSAT that meets all customer expectations. Elena Delgado Ballester (2003)
BRT	BRT2	I know that China assembly & test OSAT will compensate for the problems of its products in certain ways.
	BRT3	I think China assembly & test OSAT is sincere and honest in introducing the Local IC design house project.
	BRT4	I think China assembly & test OSAT will provide timely feedback on Local IC design house needs and problems.
Brand Trust	Quality BQT1	I think the quality of China assembly & test OSAT is more competitive than its counterpart OSAT.
BQT	BQT2	The quality of China assembly & test OSAT is reliable, and the annual quality is abnormally lower than the quality agreement.
	BQT3	China assembly & test OSAT can meet expectations, and there is no risk in buying

3.1.1.3 Sources of customer orientation scale items

For customer-oriented measurement research, Donovan et al. developed a customer-oriented measurement scale for the service industry. Put forward a customer-oriented four-dimensional structure that is to obey customers, understand customer needs, service delivery and interpersonal relationships. And tested the practicability of the scale in the catering industry and pointed out that customer orientation will affect customer satisfaction and customer loyalty. Narver and Slater developed and validated the market oriented MKTOR scale. Because of customer-oriented measurement, there is no consensus or universally accepted conclusion. Based on the research in this article, the measurement scales of Narver and Slater and others are adopted, as well as the characteristics of the local semiconductor supply chain. When Local IC design house purchases assembly & test services for China, customer orientation is added as a new dimension of purchase behavior. And from creating customer value, understanding customer needs. Customer satisfaction is the goal, and four aspects of after-sales service are measurement items. Combine the supplier selection criteria mentioned in this article and the design in the transaction. For the customer-oriented related test items in this article, the pre-test items are represented by codes CO1, CO2, CO3, and CO4.

Table 3-3 Customer orientation measurement items

Research variables	Code	Measurement items	Source
Customer orientation	CO1	Know the end customers' requirements for China assembly & test OSAT, such as the OSAT specified by end customers for assembly and test.	Narver&Slater
	CO2	When the project is imported, the end customer chooses to evaluate in order of price, delivery time rate and quality	
	CO3	Out of transaction cost savings, existing end customers are satisfied that China assembly & test OSAT provides additional engineering services and free domestic logistics after-sales, such as free design, simulation, and free engineering fixture preparation for new projects.	
	CO4	Existing end customers who designate China assembly & test OSAT for domestically shipped products need to clearly guarantee and compensate for all losses caused by	

abnormalities

3.1.1.4 Sources of behavior attitude scale items

Behavior attitudes, the positive or negative feelings and judgments of local IC design house's purchase of Chinese assembly & test services can be divided into instrumental attitudes and emotional attitudes. In this study, local IC design house believes that it is the right choice to purchase assembly & test services in China and may prioritize purchasing assembly & test services in China as a measure of behavior and attitude. They are represented by codes BA1, BA2, BA3, BA4, and the contents of the four measurement items are shown in Table 9.

Table 3-4 Behavior attitude measurement items

Research variables	Code	Measurement items	Source
Behavior Attitude	BA1	It is the right choice to purchase assembly & test services in China	Ajzen (2002);
	BA2	Local IC design house will give priority to purchasing assembly & test services for China	Chen.M(2008);
	BA3	I support the company to purchase assembly & test services for China	SPENCE A, TOWNSEND(2006)

3.1.1.5 Source of subjective norm scale items

Subjective norms can be divided into prescriptive norms and descriptive norms. Mandatory norms mainly refer to the perceived pressure of individuals on the evaluation attitude of important influence groups on a certain behavior. Descriptive norms mainly refer to the influence of the existing behaviors of individuals on important groups (Lu Qiang, 2015). The measurement items for subjective norms in this study include four measurement items including leaders, end customers, and colleagues who approve of purchasing package and testing services for China, and supply chain recommendations for purchasing package and testing services for China. They are represented by codes SN1, SN2, SN3, and SN4, respectively. As shown in Table 3-6.

Table 3-5 Subjective norm measurement items

Research variables	Code	Measurement items	Source
Subjective norm	SN1	The purchasing decision-making departments are in favor of purchasing assembly & test services for China.	Ajzen (2002);
	SN2	Your leader agrees to purchase assembly & test services for China.	Lu Qiang (2015)
	SN3	OSAT that has passed the annual quality system audit of end customers attracts you to purchase its assembly & test services.	Bamberg S, Hunecke M (2007)
	SN4	OSAT certified by the ISO quality certification system attracts you to purchase its assembly & test services.	

3.1.1.6 Sources of perception behavior control scale items

Perception behavior control is the degree of difficulty and resistance that consumers feel when they will take a certain behavior and indicates whether consumers can control and perceive a certain behavior by their own will. Relevant studies have shown that factors such as high prices and availability of organic food are the reasons that hinder consumers from buying. Similarly, this test question will combine the transaction cost theory in this research and the criteria for customers to select suppliers to design this test question, which will provide additional services, price support, shipping and priority engineering support for China's assembly & test services. The four other items are used as the measurement items of perceptual behavior control, which are represented by codes PBC1, PBC2, PBC3, and PBC4.

Table 3-6 Perception behavior control measurement items

Research variables	Code	Measurement items	Source
	PBC1	When purchasing assembly & test services for China, you can get more additional service items, such as free simulation, free logistics, and free reliability test	Ajzen (2002);

Perception Behavior Control	PBC2	When purchasing assembly & test services for China, I can easily get price support.	Bryla , Pawel (1968)
	PBC3	When purchasing assembly & test services for China, I can easily get support for order production and shipment.	
	PBC4	I can get priority engineering support when purchasing assembly & test services for China	

3.1.1.7 Source of buying intention scale item

Purchasing intention refers to an individual's judgment on the subjective probability of taking a certain behavior. In this study, local IC design house is highly likely to purchase assembly & test services in China, and it is recommended to end customers to measure the assembly & test services in China in four aspects.

FINDINGS AND DISCUSSIONS

This chapter mainly uses the data collected by the local IC design house on the buying behavior of China's assembly & test services collected by the formal questionnaire in the previous chapter, starting from the four research goals of this paper. Carry out analysis after data sorting and conduct in-depth discussion and analysis of the results of problems found. First, describe and analyze the demographic and statistical variables in the questionnaire, and get a basic summary of the interviewee. Then, descriptive analysis, reliability, and validity tests of all the variables involved in this paper will lay the foundation for the following model empirical testing. Including brand trust, including brand capacity trust, responsibility trust, quality trust, customer orientation, behavior attitude, subjective norm, perceived behavior, buying intention and buying behavior. The brand trust in the research model can accurately and effectively measure the positive correlation between brand capacity trust, brand responsibility trust and brand quality trust through second-order factor analysis. This belongs to the concept of brand trust. In addition, the research model of this paper also uses regression analysis and structural equation analysis to test and evaluate each path of the model and the whole, especially the comparison of the research model in this paper with the traditional TPB model for testing and evaluation. It is concluded that the design of the research model in this paper is reasonable. Clearly point out the similarities and differences between the research direction and previous related research and discuss the characteristics of the buying behavior of local IC design houses for assembly & test services in

China.

Sample Analysis of Interviewee Profile

The questionnaire was sent by email and paper questionnaire, and a total of 360 valid questionnaires were obtained. Analyze the demographic variables of the questionnaire sample. The sample data mainly includes gender, length of employment, department, the nature of the company to which the respondent belongs, the place of company registration, and the application of the company's products. Use SPSSAU data analysis software to analyze the questionnaire data. From the demographic characteristics of the respondents in the questionnaire in Table 4-1, the basic information of the respondents can be clearly seen.

Table 4-1 Summary analysis of respondents in the formal questionnaire (N=360)

Name	Options	Frequency	Percent (%)	Cumulative Percent (%)
Your gender	Male	259	71.94	71.94
	Female	101	28.06	100
Your education	Junior college	30	8.33	8.33
	Undergraduate	145	40.28	48.61
	Postgraduate and above	185	51.39	100
Your working years	Years 0-5 years	26	7.22	7.22
	5-10 years	71	19.72	26.94
	10-15 years	111	30.83	57.78
	15-20 years	152	42.22	100
Your department	Senior managers (executive officers, technical officers, etc.)	36	10	10
	Operations/Procurement Department	108	30	40
	Engineering Department	108	30	70
	Quality department	108	30	100

	Communication chip	170	47.22	47.22
Main market applications of your product	Consumer chips	120	33.33	80.56
	Industrial/Security Chip	20	5.56	86.11
	Computer/High-speed computing	30	8.33	94.44
	vehicle electronics	20	5.56	100
	South China (Guangdong, Shenzhen, Zhuhai, etc.)	110	30.56	30.56
Where your company is registered	East China (Shanghai, Hangzhou, Wuxi, Anhui, etc.)	190	52.78	83.33
	North China (Beijing, Tianjin, etc.)	30	8.33	91.67
	Central and Western (Xi'an, Wuhan, etc.)	30	8.33	100
The nature of your company	Start-up chip design company	100	27.78	27.78
	Chip design listed company	200	55.55	83.33
	China TOP 10 Design Company	60	16.67	100
Total		360	100	100

From the summary analysis of the interviewees in Table 4-1, there are 360 valid questionnaires in total this time. Describe the basic outline of the interviewee from seven aspects: gender, education level, working years, department, main market application of the company's products, company registration place, and company nature, as shown in the figure below. Analyze the structure distribution of each variable one by one.

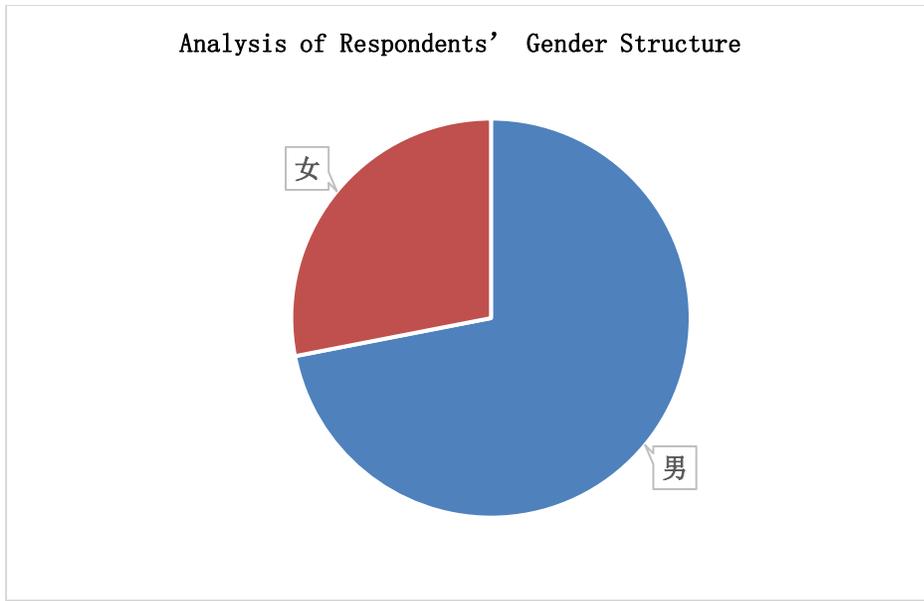


Figure 4-1 Gender structure analysis of respondents

From the analysis of the gender structure of the sample in Figure 4-1, among the 360 respondents, 259 are males and 101 are females, accounting for 71.94% and 28.06% of the sample respectively. There are slightly more male respondents than female respondents, combined with the current ratio of male to female students in the semiconductor industry and the large proportion of males in the science and engineering background industries. Therefore, the gender structure of the questionnaire sample is more consistent with the actual situation.

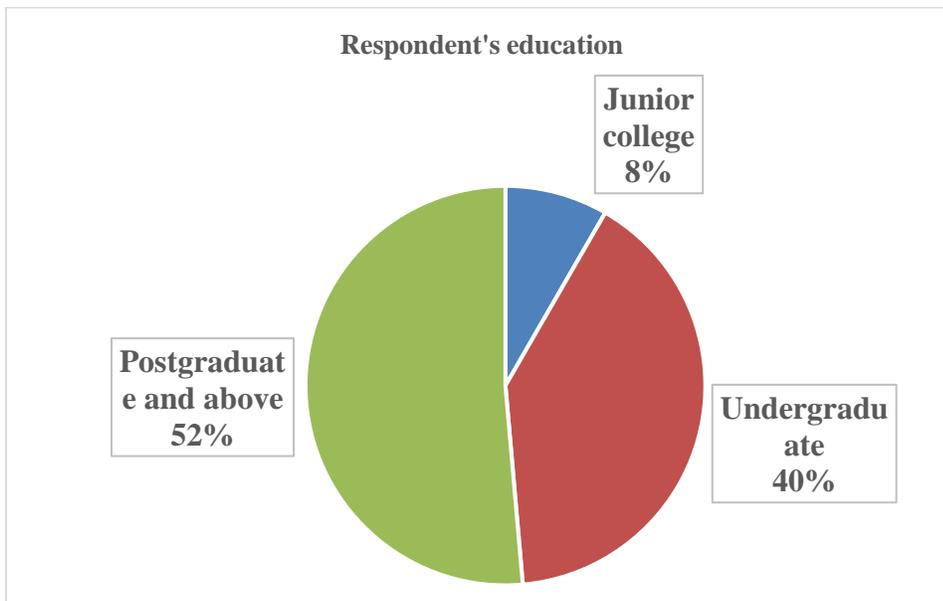


Figure 4-2 Education level analysis of respondents

From Figure 4-2, the education level of the respondents includes college, undergraduate, graduate and above. Among them, there are 30 specialists, 145 undergraduates, and 185 graduates or above, accounting for 8.33%, 40.28% and 51.39% respectively. The employees in the local IC design house generally have higher education.

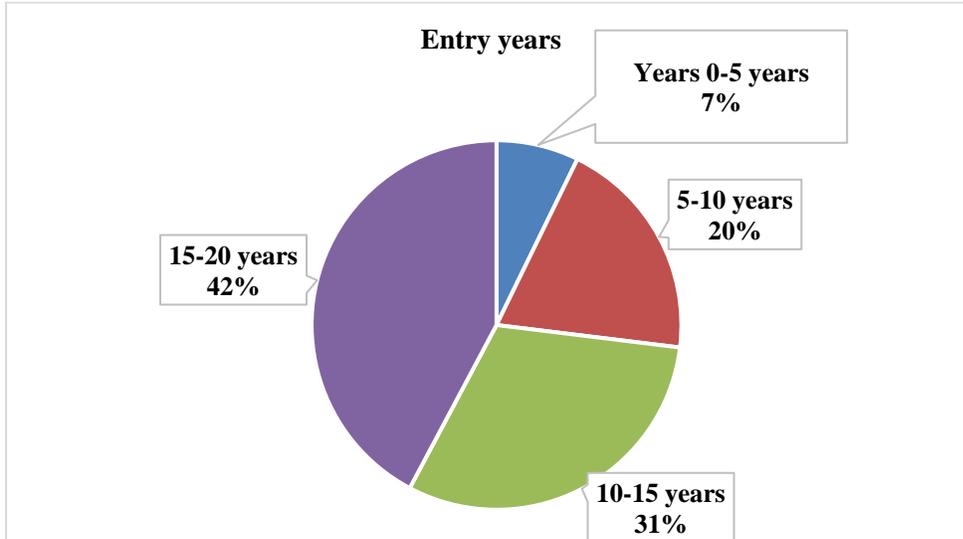


Figure 4-3 Employment years analysis of respondents

According to Figure 4-3, the number of years of employment of the sample of interviewees, among the 360 respondents, 26 have 0-5 years of employment, 71 have 5-10 years, 10-15 years, and 15-20 years. There are 111 people and 152 people, accounting for 7.22%, 19.72%, 30.83%, and 42.22% of the sample, respectively. Combining the growth years of Chinese chip design companies and the average years of start-ups established at present, the interviewee’s entry structure in this questionnaire is more consistent with the growth years of local IC design houses.

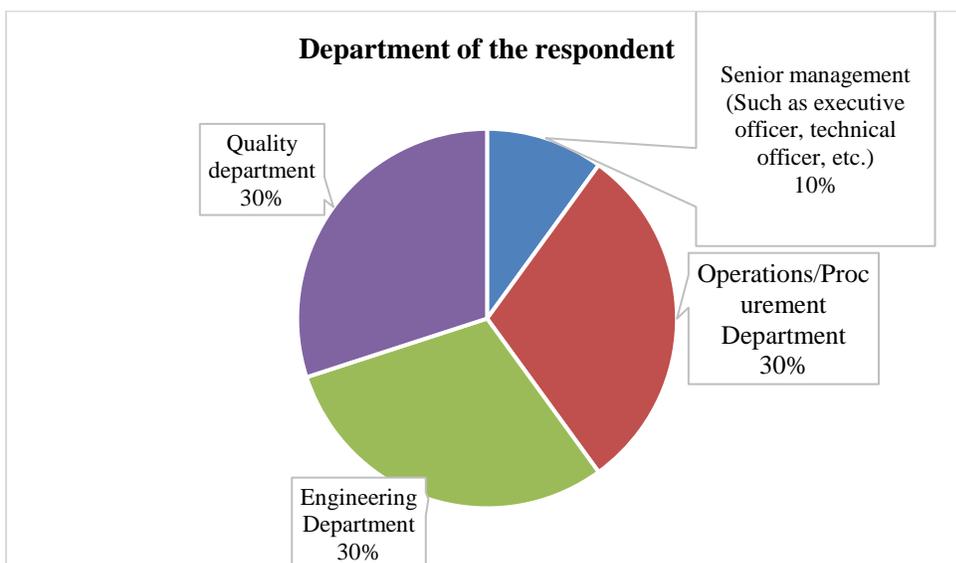


Figure 4-4 Department analysis of respondents

Refer to the departmental organization structure of the actual assembly & test and chip design industries from Figure 4-4. The survey results show that the procurement of China's assembly & test services for local IC design houses is concentrated in procurement operations, engineering, quality, and company management functions. These departments conform to the organizational department structure of chip design company and assembly & test OSAT. In a specific industry context, it is believed that the selection of research samples and research objects in this way is more conducive to the validity of the questionnaire. Research shows that there are 36, 108, 108, and 108 people in procurement operations, quality, engineering, and management, respectively. This is in line with OSAT's normal business docking window for assembly & test. It can be speculated that when a local IC design house purchases assembly & test services for China, the four departments mentioned above will affect the procurement behavior.

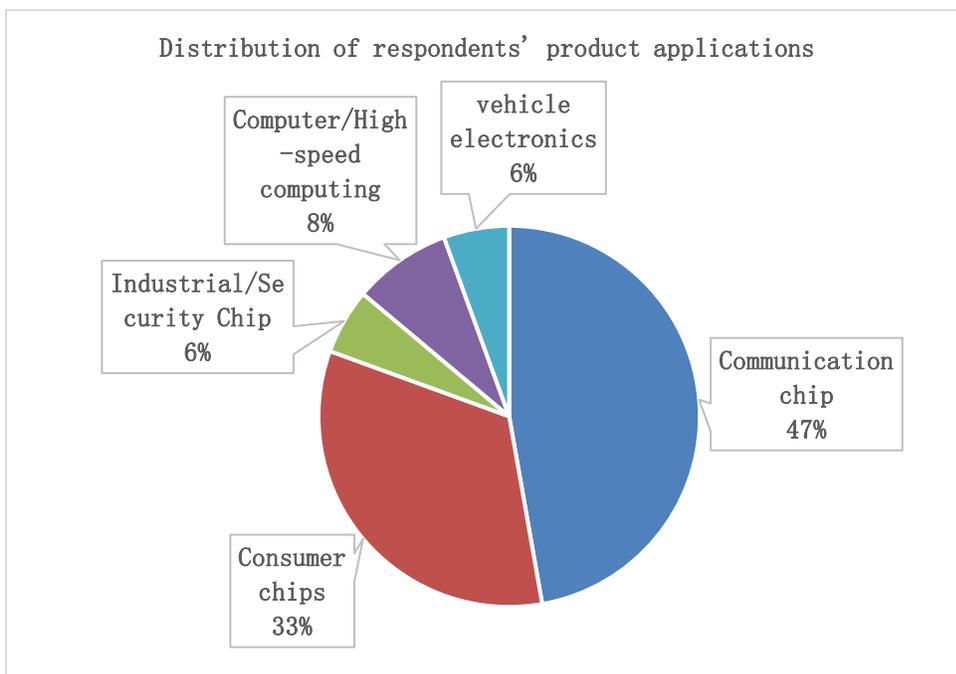


Figure 4-5 Distribution of respondents' product applications

From Figure 4-5, the application areas of the interviewee's sample company's products, this research focuses on communications, such as smart mobile terminal chips. Consumer, such as multimedia processors, IoT chips and other chip design companies. Industrial/security, such as industrial equipment construction, urban construction and other chips. Computer high-speed computing, such as 5G, large-scale network base stations, Bitcoin, and other chips. Automotive electronics, such as five major chip areas such as ADAS and TPS. This is fully in line with the localization trend of China's chip products and the positioning of the main market applications, indicating that the structure of this sampling is correct.

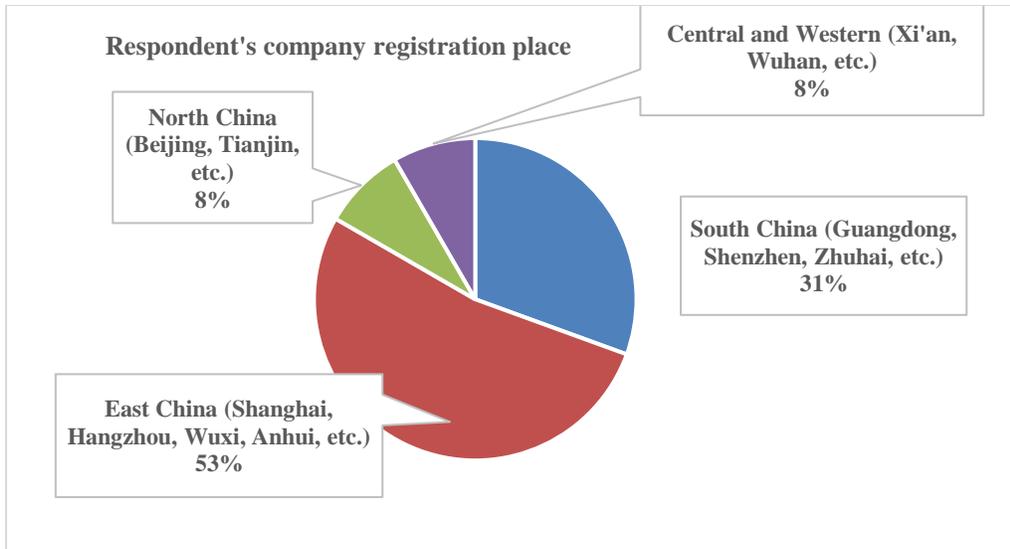


Figure 4-6 Respondents' company registration place

From Figure 4-6, where the respondents’ sample companies are registered, the locations of the respondents’ companies are concentrated in Guangdong, Shanghai, Beijing, and the central and western regions. However, Shanghai and Beijing are still gathering places for IC design companies, of which Beijing, Shanghai, and Guangdong account for 92%. This is very consistent with the registered locations of China's existing chip design companies. As the second-tier growth area for new chip design companies, the Midwest region accounted for 8.3% of the survey. It shows that the chip design structure of this survey is relatively balanced and more in line with the distribution of chip design companies.

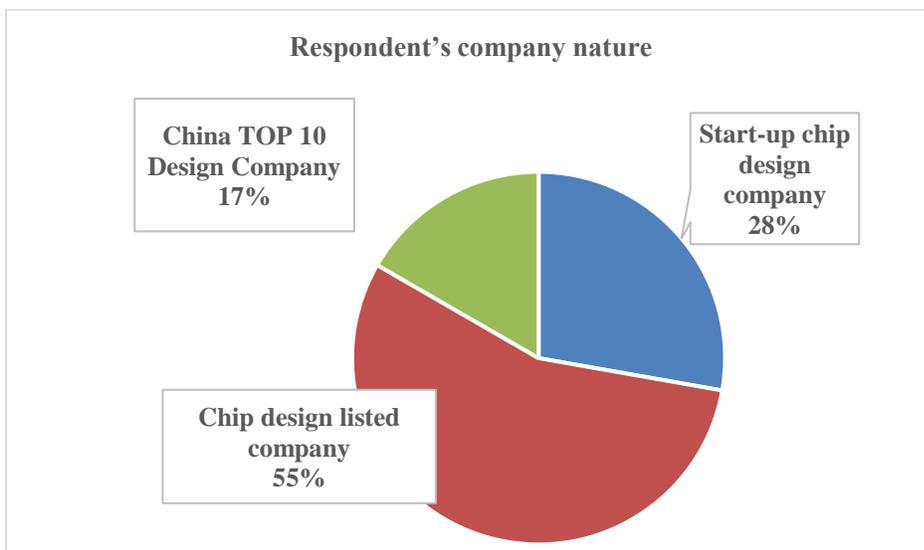


Figure 4-7 Nature of the respondents' company

According to the nature of the sample companies of the interviewees in Figure 4-7, among the 360 interviewees, according to the size of the current chip design company, they are divided into

start-up chip design companies, chip design listed companies, and top ten local chip design companies. This is in line with the size classification of Chinese chip design companies.

Questionnaire Analysis of the Local IC Design House on the Buying Behavior of Assembly & test Services in China

In the analysis of the questionnaire, the questionnaire involved 6 dimensions: brand trust, customer orientation, behavior attitude, subjective norm, perception behavior control, and buying intention and buying behavior. However, the brand trust in this paper is divided into three dimensions based on the literature data and the summary and summary of the research results of predecessors: brand capacity trust, brand responsibility trust, and brand quality trust. Therefore, this questionnaire scale, such as descriptive analysis, reliability, and validity data analysis, will be analyzed in 9 dimensions. This research will verify the correlation between the three dimensions of brand capacity trust, brand responsibility trust and brand quality trust through confirmatory factor analysis and second-order factor analysis and measured that the three of them belong to the concept of brand trust.

Table 4-2 Descriptive analysis of buying behavior of local IC design house (N=360)

Dimension	Sub-dimensions	Test item	N	Min.	Max.	Mean	S.D.	
Brand Trust	Brand Capacity Trust	BCT1	360	2	6	4.283	1.121	
		BCT	360	2	6	4.061	1.241	
		BCT3	360	1	6	4.161	1.211	
		BCT4	360	3	6	4.253	1.018	
	Brand Responsibility Trust	BRT1	360	2	7	5.161	0.762	
		BRT	360	2	6	5.161	0.689	
		BRT3	360	3	7	5.081	0.725	
	Brand Quality Trust	BQT1	360	2	6	4.378	0.721	
		BQT	360	3	7	4.331	0.768	
		BQT3	360	2	7	4.328	0.778	
	Customer orientation		CO1	360	2	7	5.303	0.851
			CO2	360	2	7	5.311	0.85
		CO3	360	2	7	5.294	0.822	

	CO4	360	2	7	5.264	0.87
Behavior Attitude	BA1	360	2	6	4.681	1.107
	BA2	360	2	6	4.692	1.095
	BA3	360	2	7	4.653	1.161
Subjective Norm	SN1	360	3	7	5.25	0.863
	SN2	360	3	7	5.289	0.834
	SN3	360	2	7	5.25	0.879
	SN4	360	3	7	5.303	0.779
Perception Behavior Control	PBC1	360	3	6	4.944	0.763
	PBC2	360	3	6	4.975	0.788
	PBC3	360	3	6	4.853	0.802
Buying intention	BI1	360	3	6	4.972	0.688
	BI2	360	3	6	5.008	0.682
	BI3	360	2	6	4.85	0.814
	BI4	360	2	6	4.867	0.796
Buying Behavior	BB1	360	4	6	5.108	0.717
	BB2	360	4	6	5.136	0.701
	BB3	360	4	6	5.122	0.701

Table 4-2 shows that this questionnaire involves 9 dimensions: brand trust, customer orientation, behavior attitude, subjective norm, perception behavior control, and buying intention and buying behavior. Among them, brand trust includes three sub-dimensions: brand capacity trust, brand responsibility trust, and brand quality trust. This study has 9 dimensions, including 7 independent variables: brand capacity trust, brand responsibility trust, brand quality trust, customer orientation, behavior attitude, subjective norm, perception behavior. One intermediary variable, buying intention. One dependent variable, buying behavior. Observed from the questionnaire survey data, the higher scores are the dimensions of brand responsibility trust, customer orientation, and subjective norms. The research in this paper inferred that the local IC design house has a high degree of trust in China assembly & test OSAT. Including: The local IC design house trusts that the chip design company will be able to compensate when there are problems with the products packaged and tested in China. Trust it to provide sincere and honest service to

China assembly and test and trust China assembly & test OSAT to always give feedback on the needs of local IC design houses. From the customer-oriented dimension data, when the local IC design house chooses OSAT for assembly & test services in China, the end customer orientation is getting stronger. This means that if you want to win more local IC design houses, you must first win the recognition and trust of end customers. The subjective norm dimension includes colleagues and leaders who agree to purchase assembly & test services for China. End customers prefer to purchase assembly & test services for China and the chip design supply chain recommends purchasing assembly & test services for China. Analysis of the questionnaire data shows that in the chip design industry, more and more people and organizations recognize China's assembly & test services for China. The low scores in the table are brand capacity trust and brand quality trust. based on the current industry background, although in recent years, China's assembly & test services' technical capabilities and high-quality control capabilities have been rapidly improved. However, compared with foreign assembly & test OSAT, there is still a certain gap. Therefore, based on the analysis of questionnaire data, it is inferred that the local IC design house still has its own reservations about these fields, which is in line with the industry. Local IC design house's realistic attitude towards China's assembly & test services, as well as the actual technology and quality of assembly & test OSAT.

Conclusion

This dissertation is based on the consumer buying behavior model, the theory of planned behavior, customer orientation, and brand trust theory. Combining the characteristics of local IC design house's buying behavior for assembly & test in China. A questionnaire and a theoretical model of the buying behavior of China's assembly & test services by the local IC design house were compiled. Before formally conducting the empirical test on the research objectives of this article, it first analyzes the local IC design house's purchase of Chinese assembly & test services, the brand trust concept attribution, and its test analysis. From the three sub-dimensions of brand capacity trust, brand responsibility trust, and brand quality trust, it examines and analyzes brand trust. (Atulkar, 2020; Sanny et al., 2020)

Through SPSSAU data analysis software, analyze the reliability and validity of brand capacity trust, brand responsibility trust, brand quality trust, and confirmatory factor loading coefficient analysis. Through the model fitting index, distinguish the analysis of validity and correlation. It is concluded that brand capacity trust, brand responsibility trust and brand quality trust have a strong correlation. Then through the second-order confirmatory factor analysis of brand capacity trust, brand responsibility trust, and brand quality trust, it shows significance. It can be judged that the three factors also have a strong correlation among the second-order factors. It is concluded that the three factors of brand trust can accurately and effectively measure the concept of brand trust, which provides a research basis for the empirical test of this article. Secondly, there are 4 hypothetical research objectives in the research model of this article. First, the research goal is the role of brand trust in the purchase of Chinese assembly & test services by

local IC design houses under the TPB theoretical model and empirical verification. Second, under the theoretical model of TPB, the customer-oriented role of local IC design houses in purchasing Chinese assembly & test services and empirical verification. Third, the local IC design house's empirical analysis of China's buying behavior of assembly & test services and its influencing factors. Empirical analysis of the fourth local IC design house's buying intention and its effect on China's assembly & test services. This chapter will summarize the research goals of this dissertation one by one. The main conclusions are as follows:

First, under the TPB theoretical model, the role of brand trust in the purchase of Chinese assembly & test services by local IC design houses and empirical verification.

First, use SPSSAU software to conduct a descriptive analysis of brand capacity trust, brand responsibility trust, and brand quality trust.

According to the descriptive analysis of brand capacity trust, 62.5% of the respondents believe that the technical capabilities claimed by China assembly & test OSAT are in line with reality. 42.5% of the respondents believe that China assembly & test OSAT is opposed to the fulfillment of service promises. 37.78% of respondents believe that China assembly & test OSAT cannot handle quality issues well. 37.78% of respondents believe that China assembly & test OSAT does not have a high level of comprehensive strength. Descriptive analysis of Brand Responsibility Trust shows that 97.78% of respondents trust China assembly & test OSAT to compensate for abnormal problems. 100% of the interviewees believe that China assembly & test OSAT is sincere and honest in introducing local IC design house projects. Only 0.83% of the respondents disagree that China assembly & test OSAT will provide timely feedback on the needs and problems of local IC design houses. The three items of the brand responsibility trust show that the top 100 local design companies have confidence in the responsibility of China assembly & test OSAT. Brand quality trust descriptive analysis 62.22% of respondents believe that the quality of China assembly & test OSAT is more competitive than its peer OSAT. 62.78% of the respondents believe that the quality of China assembly & test OSAT is reliable, and the annual quality is abnormally lower than the quality agreement. 61.95% of respondents trust China assembly & test OSAT to meet expectations and feel that there is no risk in their purchase. In this study, the variables under the TPB theoretical model are behavior attitude, subjective norm, perception behavior control, buying intention, and buying behavior. According to the phenomena observed in actual work and the background of chip design and assembly & test industry, brand trust and customer orientation have been increased, which are used as a new dimension of this research to empirically verify its role. To study the influence relationship between variables, use the SEM structural equation model to draw the following conclusions. When brand trust has an impact on customer orientation, the standardized path coefficient value is $0.754 > 0$. And this path shows a level of significance of 0.01 ($z=5.123$, $p=0.000 < 0.01$). It shows that brand trust will have a significant positive impact on customer orientation. Brand trust positively affects behavior attitude, subjective norm, perception behavior control, buying intention and buying behavior. Analysis of standardized load coefficients shows that there is a good relationship between brand

trust and various variables. The model fitting index shows that the questionnaire survey model has good fitting validity. Finally, the conclusions of testing the hypothesis of the research objectives are all valid. This article combines Yuan Denghua, Luo Siming, and Li You (2007) on brand trust structure and its measurement research. Its research shows that brand trust is the willingness of consumers to recognize a brand based on positive expectations of brand quality, behavioral intentions, and ability to fulfill promises in a risk context. Brand trust is composed of three dimensions: consumers' trust in brand quality, good faith, and ability trust. Therefore, this article has verified through empirical research that brand trust positively affects customer orientation, behavior attitude, subjective norm, perception behavior control, buying intention and buying behavior. From this, it is deduced that brand trust positively affects the attitude, subjective norms, and perception behavior control. It has increased the positive attitude of Local IC design house's purchase of China's assembly & test behavior, and it is calculated that the stronger the willingness to act. Secondly, the more positive the subjective norms of Local IC design house's purchase of Chinese assembly & test behavior, the stronger the individual's willingness to act. Finally, at the same time, local IC design house's perception of buying Chinese assembly & test behavior is also increased. It is calculated that the more positive attitudes and subjective norms are, and the stronger the perception behavior control, the stronger the behavior of Local IC design house to purchase Chinese assembly & test. This is consistent with the research theory of Ajzen (1988).

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