

Service-Quality Scale for Chinese Working Mothers' e-Learning Platforms: Development and Validation

Zhang Man*

*Faculty of Art and Design, Universiti Teknologi MARA
Kedah Branch Campus, Kedah,
Malaysia
Email: 2023947047@student.uitm.edu.my*

Azhari Md Hashim*

*Faculty of Art and Design, Universiti Teknologi MARA
Kedah Branch Campus, Kedah,
Malaysia
Corresponding author
Email: azhari033@uitm.edu.my*

Wan Noor Faaizah Wan Omar

*Faculty of Art and Design, Universiti Teknologi MARA
Kedah Branch Campus, Kedah,
Malaysia
Email: wfaaizah@uitm.edu.my*

Zhang Xin*

*Jiangsu Health Vocational College,
Jiangsu Province, Nanjing,
China
Email: 2741781489@qq.com*

Zhong Jing*

*Faculty of Art and Design, Universiti Teknologi MARA,
Perak Branch, Seri Iskandar Campus,
Seri Iskandar, Perak,
Malaysia
Email: zj504977135@163.com*

Received Date: **01.05.2025**; Accepted Date: **01.07.2025**; Available Online: **13.07.2025**

**These authors contributed equally to this study*

ABSTRACT

The rapid progression of online education has rendered the enhancement of service quality a key concern in augmenting user experience. This study aims to create service quality rating scales for online education platforms specifically designed for Chinese working mothers, in order to comprehensively assess the unique needs and experiences of this demographic while using the platforms. The scale was created based on the SERVQUAL framework, and the initial dimensions were established through a literature review. The conventional dimensions of service quality were refined and redefined from the user experience

viewpoint, highlighting essential factors such as interaction experience, emotional support, interface intuitiveness, and personalized service, to more precisely reflect the service quality perceived by working mothers in China. The study utilized a questionnaire for data collection, employing SPSS 26.0 and AMOS 24.0 to conduct exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to evaluate the structural validity and reliability of the scales, respectively. The finalized measure had six dimensions: responsiveness, reliability, assurance, tangibility, empathy, and work-family balance, including a total of 40 items. The empirical results reveal that the established scale exhibits robust reliability and validity, providing innovative perspectives on the application of service quality theory from the user experience viewpoint while also delivering targeted recommendations for improving service design in online education platforms.

Keywords: *Chinese working mothers, Evaluation of service quality, Factor analysis, Online education platform, Scale development*

INTRODUCTION

The fast growth of the Internet and smart technologies has made it easier for online education platforms to share high-quality learning materials by removing time and space barriers. This makes learning much more effective. In 2022, the total number of Internet users in China reached 1.032 billion, with 60% engaging in online studies for 30 to 60 minutes daily (China Internet Network Information). In 2022, the total number of Chinese Internet users will reach 1.032 billion, with 60% engaging in online studies for 30–60 minutes daily (China Internet Network Information Center, 2022). Online education has emerged as a significant component of the contemporary educational framework, particularly in offering flexible learning options for working mothers in China.

In Chinese society, moms typically serve as the primary decision-makers in family education, and working mothers particularly require the convenience, flexibility, and efficiency of online education platforms as they balance the twin duties of work and family (Yang, 2018). Data indicate that around 60% of employed mothers allocate 1–3 hours daily to parenting and education (Wuyou, 2021). Chinese working mothers want not only flexible and diverse educational resources but also platforms that offer enhanced emotional support, interface design, and work-family balance. In light of the three-child policy and evolving family education paradigms, the demand for online education platforms among Chinese working women exhibits new traits, underscoring the significance of platform service design and user experience.

Although the demand for online education is increasing, current research predominantly emphasizes technical aspects (e.g., system quality and information quality), neglecting the essential needs of working mothers, including emotional support, interaction design, and time management. Also, most of the current frameworks for service quality don't address the growing need for "work-family balance," which makes it harder to fully represent the unique needs of working mothers in China. It is crucial to address this gap for scholars and online education platforms to enhance their practices.

The SERVQUAL model, as an effective tool for analyzing user needs, has been widely used in service quality measurement in education, healthcare, and other fields (Parasuraman et al., 1988). However, most of the existing studies have focused on the student population, with particular attention to technical dimensions, ignoring the unique needs of working mothers on online education platforms (Liu et al., 2022). In this study, we added the dimension of "work-family balance" by integrating the user experience and service quality frameworks and constructed a service quality evaluation scale for Chinese working mothers on online education platforms. Exploratory Factor Analysis (EFA) and Confirmatory

Factor Analysis (CFA) were used to make sure that the scale was structurally valid. Structural Equation Modeling (SEM) was then used to see how useful and well-fitting the new dimension was to the model. This study not only expands the service quality theory and proposes a new analytical framework but also provides practical guidance for online education platforms to better meet the needs of Chinese working mothers during the design and optimization process.

This study makes a big contribution to the body of knowledge about the quality of online education services. Specifically, it offers a new way to look at the service quality needs of working mothers in China who tutor their kids, combining user experience and service quality perspectives. The study also offers theoretical support for enhancing the design of online education platforms, particularly catering to the specific demands of working mothers. Future studies may investigate the disparities in online educational requirements of working women in facilitating their children's learning across various cultural and regional contexts and assess the applicability and generalizability of the scale to diverse cultures and educational platforms.

LITERATURE REVIEW

With the rapid development of online education, platforms have become an important tool for Chinese working mothers to tutor their children. These platforms play an important role in meeting users' personalized learning needs by providing authoritative and reliable course content, convenient technical support, and intuitive and friendly interface design. In addition, Chinese working mothers, as a special user group, are not only concerned about the practicality of the courses and the responsiveness of the platforms but also expect the platforms to provide more help in terms of interactivity, emotional support, and work-family balance. Against this background, scientific evaluation of the service quality of online education platforms to provide guidance for optimizing platform functions and meeting the needs of Chinese working mothers has become a key direction for current research.

Theory and Modeling of Service Quality Evaluation

Parasuraman et al. proposed the SERVQUAL model as a classic tool for service quality evaluation. The Service Quality Gap Model (SQGM), which centers on the gap between the user's actual perceptions and expectations, determines the quality of a service. Healthcare (Jonkisz et al., 2021), banking (Raza et al., 2020), and higher education (Abbas, 2020), among others, have widely used the model, which comprises five core dimensions: reliability, responsiveness, assurance, empathy, and tangibility, to validate its cross-domain applicability.

The SERVQUAL model is an important guide for the evaluation of the service quality of online education platforms, which not only involves the learning effect but also includes the gap analysis between the quality of experience and the expected quality. However, the limitations of traditional models in terms of emotional support, personalized interaction, and time management are gradually emerging. User experience, as an important supplement to service quality, focuses on psychological feelings, interaction satisfaction, and emotional resonance. The needs of Chinese working mothers for online education platforms cover unique requirements, such as technical reliability, flexible scheduling, and work-family balance. Therefore, it is necessary to extend the SERVQUAL model to incorporate the core elements of user experience, in order to assess the platform's service quality more comprehensively and meet the unique needs of this group.

Analysis of Research Related to Service Quality Evaluation Scale for Online Education Platforms

This study systematically combed through the relevant literature on the service quality evaluation of online education platforms and comprehensively summarized the scholars, topics, objects, design methods, and evaluation dimensions of the existing studies, as shown in Table 1.

Table 1. Dimensional Combing for Evaluation of Relevant Online Educational Services

| Scholars | Research Topics | Research Groups | Dimensional Design Methodology | Evaluation Dimensions |
|--------------------------|--|--|---|--|
| Cheng & Xiao (2019) | Online Education Website Satisfaction Measurement | Users of online education platforms | User perception evaluation | Usability, interaction quality, information quality, system quality, service quality |
| Li & Niu (2020) | Evaluation of the quality of online learning platforms | Users of online education platforms | Delphi method | Platform Functionality, Instructional Design, Instructional Content |
| Liu, Wu, & Li (2022) | Quality Evaluation of Online Education Based on D&M Modeling | Users of China University MOOC and Super Star Catechism Course | Information Systems Success Modeling, Fuzzy Integrated Evaluation | System quality, information quality, service quality |
| Chen, Lin, & Yang (2024) | Evaluation of the quality of online learning services | University student | SERVQUAL model, coefficient of variation method | Tangible, Interactive, Reliable, Responsive, Useful |
| Xiao, Sun, & Fan (2024) | Evaluation system for the quality of distance education services | Schoolchildren | SERVQUAL model, questionnaire | Tangibility, homogeneity, reliability, responsiveness, usefulness |

Upon synthesizing the pertinent literature, it is evident that contemporary research predominantly emphasizes the following characteristics: The research encompasses a broad spectrum; yet, the focus on specific groups is inadequate. Current research predominantly examines college students or general online education users (Liu et al., 2022; Xiao et al., 2024), offering some universal insights but neglecting the service quality requirements of specific contexts or particular demographics. Standardized evaluation criteria emphasize functionality and technical aspects. Cheng and Xiao (2019) highlight the significance of system quality and information quality in assessing service quality and suggest avenues for enhancement. Li and Niu (2020) concentrate on the reliability of technical support and its influence on user satisfaction. While these studies establish a scientific foundation for evaluating the quality of online education services, the investigation into user experience remains inadequate, particularly neglecting essential factors such as emotional support and interaction design. While measurement instruments are gradually improving, they still struggle to meet complex demands. Current measurement instruments progressively incorporate dimensions like interaction design and interface usability (Xiao et al., 2024; Chen et al., 2024), offering a more holistic view for assessing service quality; however, they fall short in addressing the dynamic shifts in varied needs and intricate situations.

Nevertheless, current research has mostly overlooked the unique demographic of working mothers. Working mothers, a significant demographic of online education platforms, require not only efficient course content and dependable technological support but also emotional assistance, flexible scheduling, and a balance between professional responsibilities and childcare. Simultaneously, they possess elevated expectations about the interactive design, visual aesthetics, and intuitiveness of the platform. Current tools have not sufficiently addressed these requirements. This study integrates the SERVQUAL model with the UX framework and incorporates the component of "work-family balance" to more thoroughly address the distinct requirements of working mothers utilizing online education platforms.

INITIAL QUESTIONNAIRE AND SCALE MODIFICATION

There are eight steps in Churchill's (1979) famous scale development process: defining the construct's scope, making the final measurement items, refining the measurement items, doing a pre-test, collecting formal data, doing exploratory factor analysis, validation factor analysis, and evaluating reliability and validity. To ensure the accuracy of each metric, it is advisable that each metric have at least three measurement items, as many items enhance reliability. This paper will follow the above method to carefully create and test the Service Quality Evaluation Scale for China's Online Education Platform for working moms, explaining how the core and formal questions were developed and improved.

In this study, two methods, Exploratory Factor Analysis (EFA) and Validation Factor Analysis (CFA), were used to ensure the scientific validity and effectiveness of the scales. EFA was used to find possible factors and dimensions, which helped figure out and extract the key factors that best show the quality of the services. CFA was then used to make sure that these factors were stable and to check the scale's goodness-of-fit and structural validity. By combining the steps of data cleaning, item analysis, and reliability and validity tests, we ensured the reliability and validity of the scales. We will also use Structural Equation Modeling (SEM) to evaluate the applicability of the new dimension "Work-Family Balance" and the overall model fit. The reliability and validity of the scale are ensured through a combination of data cleaning, item analysis, and reliability and validity tests. Each step in the scale development process ensures that the indicators are adapted to the actual needs and cultural background of Chinese working mothers and that the scale accurately reflects the needs of the target group.

Clarify Measurement Concepts

The foundation of scale development is the clarity of the measurement concept, and different definitions may lead to bias in the scale's direction. Therefore, it is crucial to clearly define the concept's scope through literature research. In this study, we define service quality as the culmination of the abilities and characteristics of online education platforms that meet the explicit and implicit needs of Chinese working mothers during their parenting journey. This includes aspects such as course content, technical support, emotional support, user interface, and interactive experience, encompassing the entire process of user registration, usage, and feedback. The study focuses on online education platforms widely used by Chinese working mothers and explores their common characteristics from the perspective of user experience and service quality, with special attention to the unique needs and experiences of Chinese working mothers, in order to lay the foundation for the development of the scale.

Initial Scale Construction

By combing relevant literature from academic databases such as Web of Science, Scopus, and ScienceDirect, and taking into account the service quality needs of Chinese working mothers when using online education platforms, this study summarized six key dimensions: responsiveness, reliability, assurance, tangibility, empathy, and work-family balance, and accordingly designed 43 measurement items to constitute the initial item bank.

In order to ensure that the content of the scale is consistent with the linguistic and cultural background of the target group, this study utilized a back-translation method for translation and adaptation. The specific process involves translating the questions from English to Chinese and adjusting the expressions to align with Chinese culture. ② Invite language experts to proofread and adapt the translated content to ensure that the language is in line with the linguistic habits and cultural background of Chinese working mothers. ③ Back translate the Chinese questions into English and compare them with

the original text to ensure the consistency of the core meanings. We invited three experts from the fields of online education, user experience design, and social psychology to conduct interviews and provide suggestions on language expression, cultural appropriateness, and content comprehensiveness. We then revised and supplemented the items, removing redundant content and adding new items that better align with the needs of Chinese mothers. Finally, this study organized an initial item bank of 41 items, each with 6 dimensions, based on the theoretical framework, as shown in Table 2.

Table 2. Indicators and Sources of the Initial Question Bank of the Service Quality Evaluation Scale for Online Education Platforms for Chinese Working Mothers

| Dimensions | Code | Title Content | Source |
|-----------------------|------|---|---|
| Responsiveness | Res1 | The customer service team of the online education app was able to respond to my questions quickly | Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988), Holsapple, C. W., & Lee-Post, A. (2006), Ozkan, S., & Koseler, R. (2009) |
| | Res2 | Online education APP can provide timely help when encountering technical problems (e.g., network delays, etc.) | |
| | Res3 | Notifications and alerts from online education apps keep me up to date with my learning progress | |
| | Res4 | The feedback mechanism of the online education app allows me to get a quick response to my suggestions and comments | |
| | Res5 | The online education app's course schedule can be flexible and adjusted to meet my needs | |
| | Res6 | The information retrieval function within the online education app is fast and responsive | |
| | Res7 | When my child needs to learn a new lesson, I can quickly find the appropriate learning resources through the online education app | |
| | Res8 | During my child's lessons, I can quickly locate the functions needed in an online education app | |
| Reliability | Rel1 | The learning resources (e.g. videos, documents) provided by the online education app are of high quality and meet my expectations | Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988), DeLone & McLean (2003), Holsapple, C. W., & Lee-Post, A. (2006), Ozkan, S., & Koseler, R. (2009) |
| | Rel2 | Online education apps have no errors or missing learning resources in their provision | |
| | Rel3 | Online education APP has rich learning resources such as video, audio, text, etc., which can effectively enhance children's interest in learning. | |
| | Rel4 | The online education app can update the learning content and materials in time, and children can get the latest education resources quickly | |
| | Rel5 | The online education app performs tasks clearly and does not "answer the wrong questions" | |
| | Rel6 | I rarely encounter technical problems such as slow loading, crashes or other malfunctions when using an online education app | |
| | Rel7 | Online education apps can help children stay focused and avoid distractions during the learning process | |
| Assurance | Ass1 | I am comfortable with the professionalism of the teachers and instructors of the online education apps | McKnight et al. (2002), Gefen (2002), Lavie & Tractinsky (2004), Anderson, R. E., & Srinivasan, S. S. (2003) |
| | Ass2 | Online education app does a good job of protecting my personal information and privacy | |
| | Ass3 | The terms and conditions of use of the online education app are clear and reassuring to me | |
| | Ass4 | Secure and reliable payment and transaction process for online education apps | |
| | Ass5 | The learning content provided by the online education app makes me feel valuable and credible | |

| | | | |
|------------------|------|---|---|
| Tangibles | Tan1 | The interface design of the online education app is beautiful and attractive | Cyr et al. (2006), Lee & Kim (2009), Anderson & Srinivasan (2003) |
| | Tan2 | The interface of the online education app is well laid out, the key information is prominent, and the overall visual effect is pleasing to me | |
| | Tan3 | The navigation of the online education app is intuitive and clear, and I can easily find the function or course I need. | |
| | Tan4 | The icon and illustration design of the online education app is innovative, creative and easy to understand | |
| | Tan5 | The video and audio playback interface of the online education app is well-designed | |
| | Tan6 | The online education app's user guide and help files are clear and easy to understand, making it easy to get started | |
| | Tan7 | I found the online education app to be very easy to perform daily operations (e.g., browsing courses, watching videos, completing assignments) | |
| | Tan8 | I think I was able to quickly learn how to use an online educational app | |
| Empathy | Emp1 | I can receive timely feedback and suggestions from teachers on my child's learning progress through the online education app, so that I can better track my child's learning progress | Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988), Alqurashi (2019), Anderson & Srinivasan (2003) |
| | Emp2 | The design of the online education app takes into account the children's learning needs and habits, and can help children to better integrate into it | |
| | Emp3 | Online education apps provide study aids such as screenshots, notes and answers during the child's lessons to help them better achieve their goals | |
| | Emp4 | Online education app can help children learn quickly | |
| | Emp5 | My child's independent learning improved after using an online education app | |
| | Emp6 | The learning content of the online education app can meet the personalized needs of children, such as: help children to solve problems in homework | |
| | Emp7 | The online education app was able to continuously improve its services based on my feedback | |
| Balance | Bal1 | I use online education app to tutor my children, my family gives me enough support and understanding | Hill et al. (2003), Frone et al. (1992) |
| | Bal2 | The online education app helps me to better manage my family relationships because it offers flexible study schedules | |
| | Bal3 | Online Education App Helps Me Balance Work Time and Family Time More Effectively | |
| | Bal4 | I have more time to work after my child learns through online education apps. | |
| | Bal5 | After using an online education app, I rarely feel a conflict between my work and family roles | |
| | Bal6 | The use of online education apps has helped me to manage my work better, and I can spend more energy on improving my work efficiency. | |

In order to verify the scientific validity and reasonableness of the preliminary draft question items, this study invited six independent experts (three in the field of online education and three in the field of user experience) to conduct a content review. We conducted the review phase anonymously and blindly, disrupting the order of the question items, and providing a definition of service quality and a description

of the six key dimensions. The experts independently assessed the categorization and consistency of the question items. The results of the evaluation showed that the consistency level of the 41 items ranged from 71.2% to 100%, which met the standard of no less than 70% proposed by Neubert et al. (2008). The experts' suggestions led to adjustments in the expressions of some items, such as changing "the interface of the online education app is reasonable" to "the interface layout of the online education app is reasonable" to enhance the precision of the statements.

Furthermore, through discussions with five Chinese working mothers, two doctorate candidates refined the question formulations and enhanced the questionnaire's readability and clarity to ensure the scale's language was comprehensible and unambiguous. We created the initial draft of the questionnaire using clear language and pragmatic content to ensure comprehensibility and ease of completion.

Initial Questionnaire Pre-test

Prior to the actual data collection, this study developed and administered a pre-test questionnaire derived from the preliminary scale. We disseminated the pre-test questionnaire using the online survey platform "Questionnaire Star" in China, which led to the collection of 306 pre-test questionnaires. After cleansing the data to exclude surveys with illogical responses, anomalous response times, and obvious issues with the options, we acquired 225 valid questionnaires, yielding an effective recovery rate of 73.6%. The quantity of valid samples satisfied the criteria for scale creation, specifically that the sample size was a minimum of five times the number of questionnaire items (Nunnally & Bernstein, 1994). We analyzed the data using SPSS 26.0 for item analysis, exploratory factor analysis, and reliability assessments, and used AMOS 24.0 for confirmatory factor analysis to assess the structural validity and application of the scale.

Project Analysis

We first used the critical ratio method in this study to test the degree of discrimination of each question item, classifying the top 27% of the total score ranking as the high group and the bottom 27% as the low group. The results showed that the significance level of all question items in the independent samples t-test was less than 0.001, indicating that the discriminatory degree of each question item reached an acceptable standard and there was no need to delete any question item. We then used Pearson correlation analysis to test the correlation between each question item and the total score of the dimension it belongs to. The results showed that the correlation coefficients of all the items were greater than 0.4, except for item Ass4 ("The payment and transaction process of online education apps is safe and secure"), which had a correlation coefficient of 0.394. We deleted item Ass4 based on this, retested the Critical Ratio Method on the remaining items, and found no need to delete any further items. The results showed that there was no need to further delete items. Next, we assessed the data's reliability using the Cronbach's alpha coefficient. The results showed that the overall Cronbach's alpha coefficient of the initial questionnaire was 0.937, and the Cronbach's alpha coefficients of the dimensions were 0.926, 0.856, 0.785, 0.907, 0.857, and 0.847, which were all higher than 0.7. This indicated that the dimensions of the scales had excellent internal consistency and reliability.

Verification of Validity

The validity test seeks to verify the measurement precision of the scale to assure its efficacy in evaluating the target construct. This study employed exploratory factor analysis (EFA) to assess the construct validity of the measure. We evaluated the data's applicability using the KMO test and Bartlett's

test of sphericity, which yielded a KMO value of 0.896 and a Bartlett's test significance of 0.000. This indicates a strong correlation among the scale constructs, making it suitable for factor analysis. We used principal component analysis and variance maximization orthogonal rotation to do an exploratory factor analysis of the scale and find factors with eigenvalues greater than one. The research yielded six variables, including 40 items, with a total variance contribution rate of 59.934%, surpassing the usual threshold and demonstrating the scale's substantial explanatory power. The pre-rotation explained variance indicated that the first factor accounted for 29.596% of the variation. The findings of the one-way test revealed that the explanation rate of the first factor did not surpass the widely accepted threshold, suggesting an absence of considerable common method bias. Also, the factor loading values for each question item were higher than 0.4 in the component matrix after variance-maximizing orthogonal rotation. This supports the scale's strong structural validity.

FORMAL QUESTIONNAIRE AND SCALE ADJUSTMENTS

Following an assessment of the reliability and validity of the pre-test questionnaire and the removal of one item that failed to fulfill the criteria, the final formal questionnaire had 40 items in this study. The formal questionnaire comprises three sections: the initial section contains screening questions to identify qualified respondents and gather demographic information; the second section assesses Chinese working mothers' evaluations of the service quality of online education platforms; and the final section includes measurement items for related variables, primarily utilized for validity testing of the scale. This investigation employed a 5-point Likert scale to ensure the scale's reliability and measurement efficacy. The scale spans from 1 to 5, with elevated numbers signifying superior ratings. This measurement is both dependable and functional and may accurately represent the respondents' assessment of the pertinent information.

Formal Questionnaire Data Collection

This study used a questionnaire survey of Chinese working mothers aged 18 and older. We disseminated the questionnaire using the "Questionnaire Star" tool across social media platforms and educational forums, collaborating with schools and educational institutions to promote it and enhance sample coverage through a "snowball" method. The data collection period was three weeks, resulting in the acquisition of 1,899 questionnaires. After cleansing the data and removing faulty questionnaires, we acquired 1,629 valid responses, yielding an effective recovery rate of 85.8%.

The examination of sample characteristics reveals that 67% of respondents are aged 25-44, primarily during their career development and family expansion phases; their annual income predominantly falls within the range of 110,000-330,000 yuan, with 88.3% being married and family structures typically comprising 1-2 children. Furthermore, 90% of respondents utilize online education applications at least once a week, illustrating the traits of a demographic characterized by middle income, stable family structures, and frequent engagement with online education. This indicates the demographic traits of middle-aged individuals with moderate income, stable family dynamics, and frequent engagement with online education.

The self-assessment nature of the questionnaire may lead to potential issues with Common Method Variance (CMV). This study employed Harman's one-way test to assess the impact of variation, revealing that the first principal component accounted for 26.061% of the total variance, which is within the acceptable range. We randomly allocated 1629 valid data points into two groups: 1011 for Exploratory

Factor Analysis (EFA) and 618 for Confirmatory Factor Analysis (CFA) to enhance model robustness and validation validity.

Exploratory Factor Analysis (EFA)

We conducted an exploratory factor analysis using SPSS. The findings indicated a KMO value of 0.914 and a significant Bartlett's test (Sig. = 0.000, $p < 0.05$), demonstrating the data's appropriateness for factor analysis. We employed principal component analysis and maximum orthogonal rotation to extract factors with eigenvalues over 1, which led to the identification of six common factors. The total variance explained was 60.207%, indicating substantial explanatory power. The loadings for each item varied from 0.531 to 0.72, all exceeding the minimum threshold of 0.4 (refer to Table 3).

Table 3. Results of exploratory factor analysis (N=1011)

| Variant | Common Divisor | | | | | |
|---------|----------------|-------|-------|-------|---|--------------|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Res1 | 0.728 | | | | | |
| Res2 | 0.814 | | | | | |
| Res3 | 0.709 | | | | | |
| Res4 | 0.735 | | | | | |
| Res5 | 0.687 | | | | | |
| Res6 | 0.768 | | | | | |
| Res7 | 0.759 | | | | | |
| Res8 | 0.702 | | | | | |
| Rel1 | | | | 0.727 | | |
| Rel2 | | | | 0.75 | | |
| Rel3 | | | | 0.731 | | |
| Rel4 | | | | 0.762 | | |
| Rel5 | | | | 0.743 | | |
| Rel6 | | | | 0.697 | | |
| Rel7 | | | | 0.7 | | |
| Ass1 | | | | | | 0.792 |
| Ass2 | | | | | | 0.768 |
| Ass3 | | | | | | 0.731 |
| Ass5 | | | | | | 0.739 |
| Tan1 | | 0.752 | | | | |
| Tan2 | | 0.781 | | | | |
| Tan3 | | 0.746 | | | | |
| Tan4 | | 0.717 | | | | |
| Tan5 | | 0.749 | | | | |
| Tan6 | | 0.743 | | | | |
| Tan7 | | 0.744 | | | | |
| Tan8 | | 0.716 | | | | |
| Emp1 | | | 0.706 | | | |
| Emp2 | | | 0.74 | | | |
| Emp3 | | | 0.77 | | | |

Based on their content and attributes, we designated the components within each factor as "Responsiveness," "Tangibility," "Empathy," "Reliability," "Work-Life Balance," and "Assurance." "Work-Life Balance" and "Assurance." "Responsiveness" comprises 8 metrics that evaluate the platform's promptness in addressing course-related issues and providing feedback, thereby assisting working mothers in swiftly attending to their children's educational requirements; "Tangibility" includes 8 metrics that gauge the platform's visual appeal and operational effectiveness; and "Empathy" encompasses 8 metrics that assess the platform's dependability. "Empathy" comprises seven metrics to assess the platform's responsiveness to children's individualized learning requirements and to bolster mothers' confidence; "Reliability" includes seven metrics to indicate the platform's capacity to deliver high-quality, consistent learning resources and to guarantee a seamless learning experience. "Reliability" encompasses seven metrics, indicating the platform's capacity to deliver high-quality and stable learning resources for an uninterrupted educational experience; "Work-Life Balance" comprises six metrics, illustrating the platform's flexibility in assisting working mothers in managing their professional and familial responsibilities; "Guarantee" includes four metrics, emphasizing the platform's assurance of information and payment security, thereby bolstering users' trust in the platform. "Assurance" comprises four metrics that underscore the platform's security in information and payment, thereby augmenting consumers' trust.

The reliability assessment of the 40-item scale revealed an overall Cronbach's alpha coefficient of 0.926, with internal consistency coefficients for the factors ranging from 0.804 to 0.904, all exceeding 0.700. This indicates a high level of internal consistency and reliability, as well as a stable dimensional structure (refer to Table 4).

Table 4. Internal consistency confidence level

| Variant | Cronbach's α |
|---------------------|---------------------|
| Responsiveness | 0.904 |
| Tangibles | 0.902 |
| Empathy | 0.893 |
| Reliability | 0.887 |
| Family-work balance | 0.842 |
| Assurance | 0.804 |

Validation Factor Analysis (CFA)

We performed factor analysis for validation using AMOS 24.0 to assess the reasonableness of the model. Figure 1 illustrates the developed scale structure model and the configuration of the path coefficients from the validation factor analysis.

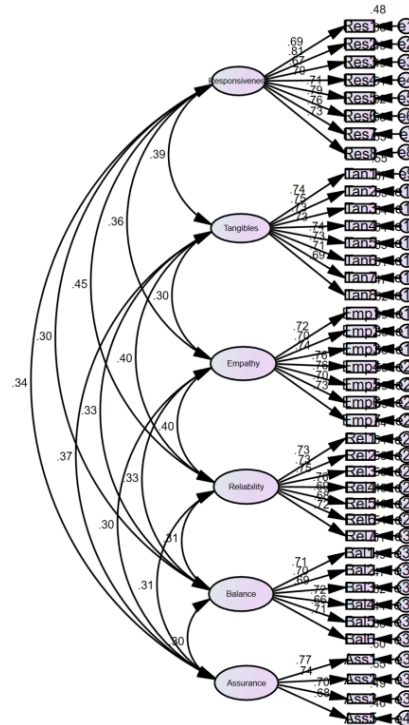


Figure 1. Validation factor analysis scale model and path coefficient

The chi-square to degrees of freedom ratio (CMIN/DF), the Goodness-of-Fit Index (GFI), the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), the Normed Fit Index (NFI), the Incremental Fit index (IFI), and the Adjusted Goodness-of-Fit Index (AGFI) are some of the model fitting metrics that AMOS lists. Table 5 indicates that the model fitting results satisfy the fitting criteria and demonstrate a satisfactory fit.

Next, we further examined the scale's reliability and validity, focusing on combinatorial reliability, convergent validity, and discriminant validity. Combined Reliability (CR) greater than 0.700 indicates that the sample data have excellent reliability (Bagozzi et al., 1995). As shown in Table 6, the combined reliabilities of the six factors range from 0.814 to 0.903, which are all greater than 0.700, indicating that the reliability of the scale is high. Regarding convergent validity, the criteria include: (1) the standardized factor loadings are all greater than 0.500; (2) the Average Variance Extracted (AVE) is greater than 0.500; and (3) the Combined Reliability (CR) is greater than 0.700. According to the results of the validated factor analysis (Table 6), all of the above conditions are satisfied, which indicates that the scale has a satisfactory convergent validity. For the discriminant validity, if the correlation coefficients between a factor and other factors are all less than the square root of its AVE value, it indicates that the factors have excellent discriminant validity. Table 7 displays the correlation test results, demonstrating the scale's strong discriminant validity.

Table 5. Overall model fit results (N=618)

| χ^2 /df | GFI | CFI | NFI | TLI | SRMR | RMSEA |
|--------------|-----|------|-------|-------|-------|-------|
| 1.809 | 0.9 | 0.95 | 0.895 | 0.946 | 0.041 | 0.036 |

Table 6. Confirmatory factor analysis results (N=618)

| Trails | | | Standardized factor loadings | S.E. | P | AVE | CR |
|--------|----------|----------------|------------------------------|-------|-----|-------|-------|
| Res1 | <-- - | Responsiveness | 0.692 | | | 0.540 | 0.903 |
| Res2 | <-- - | Responsiveness | 0.813 | 0.061 | *** | | |
| Res3 | <-- - | Responsiveness | 0.672 | 0.064 | *** | | |
| Res4 | <-- - | Responsiveness | 0.7 | 0.06 | *** | | |
| Res5 | <-- - | Responsiveness | 0.713 | 0.063 | *** | | |
| Res6 | <-- - | Responsiveness | 0.789 | 0.062 | *** | | |
| Res7 | <-- - | Responsiveness | 0.761 | 0.062 | *** | | |
| Res8 | <-- - | Responsiveness | 0.727 | 0.06 | *** | | |
| Tan1 | <-- - | Tangibles | 0.741 | | | 0.529 | 0.900 |
| Tan2 | <-- - | Tangibles | 0.752 | 0.057 | *** | | |
| Tan3 | <-- - | Tangibles | 0.727 | 0.057 | *** | | |
| Tan4 | <-- - | Tangibles | 0.734 | 0.053 | *** | | |
| Tan5 | <-- - | Tangibles | 0.736 | 0.057 | *** | | |
| Tan6 | <-- - | Tangibles | 0.726 | 0.056 | *** | | |
| Tan7 | <-- - | Tangibles | 0.715 | 0.054 | *** | | |
| Tan8 | <-- - | Tangibles | 0.685 | 0.057 | *** | | |
| Rel1 | <-- - | Reliability | 0.732 | | | 0.525 | 0.885 |
| Rel2 | <-- - | Reliability | 0.731 | 0.059 | *** | | |
| Rel3 | <-- - | Reliability | 0.751 | 0.058 | *** | | |
| Rel4 | <-- - | Reliability | 0.761 | 0.058 | *** | | |
| Rel5 | <-- - | Reliability | 0.694 | 0.059 | *** | | |

| | | | | | | | |
|-------|----------|-------------|-------|-------|-----|-------|-------|
| Rel6 | <-- - | Reliability | 0.682 | 0.06 | *** | | |
| Rel7 | <-- - | Reliability | 0.717 | 0.058 | *** | | |
| Emp 1 | <-- - | Empathy | 0.72 | | | 0.533 | 0.889 |
| Emp 2 | <-- - | Empathy | 0.697 | 0.06 | *** | | |
| Emp 3 | <-- - | Empathy | 0.744 | 0.062 | *** | | |
| Emp 4 | <-- - | Empathy | 0.758 | 0.061 | *** | | |
| Emp 5 | <-- - | Empathy | 0.764 | 0.058 | *** | | |
| Emp 6 | <-- - | Empathy | 0.7 | 0.06 | *** | | |
| Emp 7 | <-- - | Empathy | 0.726 | 0.059 | *** | | |
| Bal1 | <-- - | Balance | 0.712 | | | 0.50 | 0.851 |
| Bal2 | <-- - | Balance | 0.701 | 0.075 | *** | | |
| Bal3 | <-- - | Balance | 0.686 | 0.063 | *** | | |
| Bal4 | <-- - | Balance | 0.721 | 0.059 | *** | | |
| Bal5 | <-- - | Balance | 0.66 | 0.064 | *** | | |
| Bal6 | <-- - | Balance | 0.71 | 0.062 | *** | | |
| Ass1 | <-- - | Assurance | 0.773 | | | 0.523 | 0.814 |
| Ass2 | <-- - | Assurance | 0.741 | 0.056 | *** | | |
| Ass3 | <-- - | Assurance | 0.698 | 0.056 | *** | | |
| Ass5 | <-- - | Assurance | 0.676 | 0.055 | *** | | |

Table 7. Results of differential validity analysis (n=399)

| Variant | Assurance | Balance | Empathy | Reliability | Tangibles | Responsive ness |
|-----------------------|--------------|--------------|--------------|--------------|--------------|-----------------|
| Assurance | 0.722 | | | | | |
| Balance | 0.299** | 0.707 | | | | |
| Empathy | 0.296** | 0.332** | 0.730 | | | |
| Reliability | 0.312** | 0.311** | 0.405** | 0.725 | | |
| Tangibles | 0.369** | 0.331** | 0.304** | 0.397** | 0.727 | |
| Responsiveness | 0.341** | 0.298** | 0.355** | 0.452** | 0.389** | 0.735 |
| AVE | 0.522 | 0.5 | 0.533 | 0.525 | 0.529 | 0.54 |

Note: * denotes <0.05, ** denotes <0.01, diagonally bolded data are AVE square root values.

Validity Test

This research utilizes the SERVQUAL model, a prevalent framework in service quality studies, positing that service quality significantly impacts user satisfaction (Cronin & Taylor, 1992). We expected that the evaluations of service quality by Chinese working mothers of online education platforms would greatly influence their overall happiness. The satisfaction elements in this study pertain to Fornell et al.'s (1996) American Customer Satisfaction Index (ACSI) framework, which encompasses three components: the disparity between real perception and expected quality, the disparity between actual perception and the ideal product, and overall satisfaction. We evaluated all items using a five-point Likert scale, modified to align with Chinese linguistic standards and the study's context.

This study employed correlation and regression analyses to assess the validity of the service quality evaluation scale. The correlation analysis results indicated that all six aspects of service quality had substantial positive correlations with satisfaction ($p < 0.01$). The results of the regression analysis showed that all six aspects of service quality had a big and positive effect on overall satisfaction. The model had a lot of explanatory power (R^2 over 50%). The findings demonstrated that the service quality rating scale for the online education platform catering to working mothers in China possesses strong criterion validity.

CONCLUSION

Based on the SERVQUAL model and the user experience perspective, this study created and validated a service quality evaluation scale with six dimensions: responsiveness, reliability, assurance, tangibility, empathy, and a new factor called "work-family balance." The results show that Chinese working mothers care about more than just functional and technical aspects of service quality. They also care about emotional support, interface design, interactive experience, and finding a good work-family balance. This provides both a theoretical basis and practical advice for improving service quality in online education platforms as a whole.

The results align with prior research regarding the significance of technical support and functional optimization (e.g., Cheng & Xiao, 2019; Li & Niu, 2020; Liu et al.). The recently introduced concept of "work-family balance" addresses the deficiencies of conventional service quality theories and offers a novel research avenue for the enhancement of service quality theories and platform optimization designs.

Theoretical Contributions And Practical Implications

This study adds the "work-family balance" dimension to the SERVQUAL model, which makes it more useful for a wider range of situations. In particular, it shows how service quality theory can be used more effectively with Chinese working mothers. Putting together the most important parts of user experience (like interaction design, how easy it is to use, emotional support, and personalized service), this study rebuilds the traditional framework of service quality theory and encourages the merging of service quality and user experience theories. This provides a theoretical foundation for subsequent research and a new perspective for optimizing the service quality evaluation framework.

At the practical level, this study provides specific guidance for the design and operation of online education platforms. Platform designers should focus on making the interface more intuitive, making the operation process simpler, and making the interaction design easier to use so that working moms can easily get to and use the functions they need, especially when it comes to finding educational resources for their kids, keeping track of their progress in a course, and getting personalized learning support. The

platform should enhance emotional support modules, such as learning progress reminders and feedback on children's learning, in order to help working mothers effectively manage their children's learning progress and reduce their stress in parenting and education tasks. Based on the findings of the study, education administrations can formulate flexible criteria for curriculum review, especially for developing family-friendly courses and services that suit the needs of working mothers. These programs should take into account the time constraints of working mothers and be compatible with their work-family lifestyles in terms of content and format. In addition, education policymakers can rely on the findings of this study to adjust relevant policies, promote platforms to design features that are more responsive to the needs of working mothers, support their roles in family education, especially in the context of work-family balance, and provide a more flexible and supportive online education experience.

Limitations of the Research and Prospective Research Directions

Although this study has achieved some results, the following limitations still exist: The snowball sampling method may lead to an under-represented sample, thereby limiting the generalizability of the findings. We can use random sampling or stratified sampling in the future to confirm the scale's applicability; Two problems with the study are that it only looks at Chinese working mothers and no other cultures or user groups. To find out how different cultures affect the demand for service quality, the study could be expanded to different regions in the future. Another problem is that it doesn't look into the dynamic relationship between dimensions in enough depth. To do this, it could be combined with Structural Equation Modeling (SEM) or multilevel regression analysis to find out how service quality and service quality change over time in a cross-cultural setting. In the future, Structural Equation Modeling (SEM) or multilevel regression analysis can be used together to find out how user experience and service quality work; (4) Questionnaire surveys are the main way that data is collected, but in the future, qualitative research (like in-depth interviews or experimental research) can be used together to get more complete data on user experience, which can help improve services in more ways.

ACKNOWLEDGMENT

This paper was presented at the Creative Arts and Social Sciences International Conference (CASSIC 2025), held at the Waterfront Hotel, Kuching, Sarawak, Malaysia, from 15 to 17 April 2025. In this regard, the authors would like to express their heartfelt appreciation to Dr. Azhari Bin Md Hashim for his exceptional supervision, insightful guidance, and invaluable contributions throughout the course of this study. His steadfast support was instrumental in the successful completion of this work.

REFERENCES

- Abbas, J. (2020). HEISQUAL: A modern approach to measure service quality in higher education institutions. *Studies in Educational Evaluation*, 67, 100933.
<https://doi.org/10.1016/j.stueduc.2020.100933>
- Alqurashi, E. (2019). Predicting student satisfaction and perceived learning within online learning environments. *Distance Education*, 40(1), 133–148.
<https://doi.org/10.1080/01587919.2018.1553562>

- Anderson, R. E., & Srinivasan, S. S. (2003). E-satisfaction and e-loyalty: A contingency framework. *Psychology & Marketing*, 20(2), 123–138. <https://doi.org/10.1002/mar.10063>
- Bagozzi, R. P., & Kimmel, S. K. (1995). A comparison of leading theories for the prediction of goal-directed behaviours. *British Journal of social psychology*, 34(4), 437-461.
- Chen, H., Lin, X., & Yang, W. (2024). Research on service quality evaluation of online learning platforms based on the SERVQUAL model. *Science & Technology Vision*, 29(144), 144–147.
- Cheng, H., & Xiao, A. (2019). Construction and application of a user satisfaction evaluation index system for online education websites. *Chongqing Higher Education Research*, 2(87), 87–96.
- China Internet Network Information Center. (2022). The 50th statistical report on internet development in China. <https://www.cnnic.com.cn/IDR/ReportDownloads/202212/P020221209344717199824.pdf>
- Churchill, G. A. (1979). A Paradigm for Developing Better Measures of Marketing Constructs. *Journal of Marketing Research*, 16(1), 64-73.
- Cronin Jr, J. J., & Taylor, S. A. (1992). Measuring service quality: a reexamination and extension. *Journal of marketing*, 56(3), 55-68.
- Cyr, D., Head, M., & Ivanov, A. (2006). Design aesthetics leading to m-loyalty in mobile commerce. *Information & Management*, 43(8), 950–963. <https://doi.org/10.1016/j.im.2006.08.009>
- DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems*, 19(4), 9–30. <https://doi.org/10.1080/07421222.2003.11045748>
- Fornell, C., Johnson, M. D., Anderson, E. W., Cha, J., & Bryant, B. E. (1996). The American customer satisfaction index: nature, purpose, and findings. *Journal of marketing*, 60(4), 7-18.
- Frone, M. R., Russell, M., & Cooper, M. L. (1992). Antecedents and outcomes of work-family conflict: Testing a model of the work-family interface. *Journal of Applied Psychology*, 77(1), 65–78. <https://doi.org/10.1037/0021-9010.77.1.65>
- Hill, E. J., Ferris, M., & Martinson, V. (2003). Does it matter where you work? A comparison of how three work venues (traditional office, virtual office, and home office) influence aspects of work and personal/family life. *Journal of Vocational Behavior*, 63(2), 220–241. [https://doi.org/10.1016/S0001-8791\(03\)00042-3](https://doi.org/10.1016/S0001-8791(03)00042-3)
- Holsapple, C. W., & Lee-Post, A. (2006). Defining, assessing, and promoting e-learning success: An information systems perspective. *Decision Sciences Journal of Innovative Education*, 4(1), 67–85. <https://doi.org/10.1111/j.1540-4609.2006.00102.x>

- Jonkisz, A., Karniej, P., & Krasowska, D. (2021). SERVQUAL method as an “old new” tool for improving the quality of medical services: A literature review. *International Journal of Environmental Research and Public Health*, 18(20), 10758. <https://doi.org/10.3390/ijerph182010758>
- Lavie, T., & Tractinsky, N. (2004). Assessing dimensions of perceived visual aesthetics of web sites. *International Journal of Human-Computer Studies*, 60(3), 269–298. <https://doi.org/10.1016/j.ijhcs.2003.09.002>
- Lee, S., & Kim, B. G. (2009). Factors affecting the usage of intranet: A confirmatory study. *Computers in Human Behavior*, 25(1), 191–201. <https://doi.org/10.1016/j.chb.2008.08.007>
- Li, G., & Niu, Z. (2020). Research on the evaluation model of online learning platform quality under the Internet background. *Value Engineering*, 10(233), 233–236. <https://doi.org/10.14018/j.cnki.cn13-1085/n.2020.10.091>
- Liu, L., Wu, J. N., & Li, J. A. (2022). Construction and fuzzy comprehensive evaluation of quality indicators for online education platforms based on the D&M model. *Journal of Anhui University of Technology (Social Science Edition)*, (05), 99–103.
- McKnight, D. H., Choudhury, V., & Kacmar, C. (2002). Developing and validating trust measures for e-commerce: An integrative typology. *Information Systems Research*, 13(3), 334–359. <https://doi.org/10.1287/isre.13.3.334.81>
- Neubert, M. J., Kacmar, K. M., Carlson, D. S., Chonko, L. B., & Roberts, J. A. (2008). Regulatory focus as a mediator of the influence of initiating structure and servant leadership on employee behavior. *Journal of applied psychology*, 93(6), 1220.
- Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric Theory* (3rd ed.). McGraw-Hill.
- Ozkan, S., & Koseler, R. (2009). Multi-dimensional evaluation of e-learning systems in the higher education context: An empirical investigation of a computer literacy course. *Computers & Education*, 53(4), 1285–1296. <https://doi.org/10.1016/j.compedu.2009.06.011>
- Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988). Servqual: A multiple-item scale for measuring consumer perc. *Journal of retailing*, 64(1), 12.
- Wuyou, Q. (2021). 2021 Workplace Mothers Survival Status Survey Report. Guangming Online. https://www.thepaper.cn/newsDetail_forward_12591546

- Raza, S. A., Umer, A., Qureshi, M. A., & Dahri, A. S. (2020). Internet banking service quality, e-customer satisfaction and loyalty: The modified e-SERVQUAL model. *The TQM Journal*, 32(6), 1443–1466. <https://doi.org/10.1108/TQM-02-2020-0019>
- Xiao, X., Sun, Z., & Fan, T. (2024, June). Service Quality Evaluation System of Distance Education Based on SERVQUAL model: Taking Courses of Moral Education at Hefei Science and Technology College as an Example. In *Proceedings of the 2024 9th International Conference on Distance Education and Learning* (pp. 69-74)
- Yang, K. (2018). The agentization of motherhood: The transformation of motherhood in the context of education marketization. *Collection of Women's Studies*, (2), 79–90.