The Effect of Interactivity on Perceived Risk towards Unregistered Childcare: The Mediating Role of Technology Innovation

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Abstract **– Interactivity and technological innovation play an important role in lowering parents' perceived risks by providing transparent communication and easy access to essential information about childcare. This study investigates how technology innovation (TI) mediates the relationship between interactivity (IY) and perceived risks (PR) among mothers in unregistered childcare centers. A quantitative method was used in this study. A total of 385 responses were collected from working mothers who enrolled their children, aged 0-4 years, in unregistered childcare centers. The analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) and the Statistical Package for the Social Sciences (SPSS). Model validity and reliability were rigorously evaluated. Findings indicate that interactivity significantly promotes technology adoption, which, in turn, helps reduce perceived risks.**

The mediation analysis confirms that technology innovation (TI) serves as a pathway through which interactivity impacts perceived risk (PR), emphasizing that fostering interactive relationships can drive technological enhancements that reassure parents and mitigate safety concerns. These findings also underline the importance of promoting interactive communication and supporting technology innovation to address parental concerns about unregistered childcare centers. Future research suggests that childcare providers and policymakers should implement strategies and platforms that facilitate interactivity, Standard Operating Procedure (SOPs) and encourage technology use, fostering a safer and more trustworthy childcare environment.

Keywords **– Interactivity, technology innovation, perceived risk, unregistered, childcare centers.**

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1. Introduction

High-quality childcare centers are instrumental in promoting children's health and development. In Malaysia, the authorities strive to ensure high-quality childcare services by monitoring compliance with health and safety standards, particularly among managers of registered childcare centers [1]. However, thousands of unregistered childcare centers continue to operate without formal monitoring, thereby increasing potential risks to health and safety practices [2]. Additionally, these unregistered childcare centers provide suboptimal services, as they care for too many children. This situation leads to multitasking, lack of attention, and cognitive overload, which compromise child supervision [3], [4].

Unregistered childcare centers are often associated with the failure to provide high-quality care because they are not properly regulated and lack health and safety monitoring.

Therefore, caregivers in these centers are required to attend a mandatory course known as the Kursus Asuhan Permata, which aims to educate caregivers on proper childcare regulations [3]. Consequently, every individual or organization wishing to open a childcare center must complete the Basic Early Childhood Course.

Most cases of abuse involving babies or children often occur in unregistered childcare centers [5]. For instance, an eight-month-old baby died after being swaddled, forced with a milk bottle, covered with a cloth, and pressed with a pillow by a caregiver at an unregistered childcare center in Melaka [6]. According to the Deputy Minister of Ministry of Women, Family and Community Development (MWFCD), 1,080 childcare centers in Malaysia are still not registered. However, enforcement actions have been taken against 49.8 percent, or 538, of the 1,080 unregistered childcare centers that are not registered with the Department of Social Welfare (DSW) in the country [7]. Additionally, only 3,118 childcare centers have been officially registered nationwide [8], [9]. Therefore, this study emphasizes how interactivity and technological innovation can help reduce risks in selecting childcare centers.

2. Literature Review

This section presents a review of literature that underpins the theoretical framework of this study. The review focuses on three key constructs: perceived risk, interactivity and technology innovation.

2.1. Perceived Risk

Perceived risk influences parents' trust and decision-making when choosing childcare services. It is conceptualized as a parent's subjective judgment pertaining to the probability of a negative outcome, which usually leads to feelings of anxiety, worry, and disturbance [12]. In this context, perceived risk reflects parents' concern that their children may be mistreated or abused by caregivers at childcare centers [13]. Therefore, parents may seek to reduce undesirable risks by choosing registered and accredited childcare centers, checking reviews, and conducting thorough research before making any decisions.

Previous studies have shown that perceived risk can influence customer decision-making [12]. Perceived risks are typically measured in terms of financial risk, social risk, psychological risk and performance risk [14]. However, this study will only adapt performance risk and financial risk. Financial risk refers to parents' assessment of the potential financial loss when engaging with low-quality childcare services.

Meanwhile, performance risk is defined as parents' assessment of the uncertainty that a childcare provider may fail to deliver quality of service expected.

2.2. Interactivity

Interactivity is the process by which an organization enables individuals to communicate and exchange ideas, information, and opinions with others in a virtual environment [10]. It is also defined as the level of engagement and involvement in processes such as communication within new media and digital platforms [11]. Consequently, interactivity provides a platform for stakeholders, including the Department of Social Welfare (DSW), childcare service providers, and parents, to participate in virtual discussions. This allows them to actively share feedback, express concerns, and contribute ideas related to the quality and management of childcare services.

2.3. Technology Innovation

Injuries and fatalities of children at childcare centers often occur because parents face difficulties in making informed decisions when choosing a childcare center. This situation arises due to the lack of accessible and obtainable information for parents. Therefore, technological innovation is crucial to ensure that parents can obtain complete and trustworthy information [13]. The application of new technologies in industry or business is referred to as technological innovation, emphasizing the use of innovative technologies to create a positive impact on various business aspects [15]. For instance, technological innovation includes applications, websites, or digital systems that help parents access essential information about childcare centers [13].

3. Hypothesis Development

This section discusses the relationship between three variables selected in the study, namely interactivity, technology innovation and perceived risk. It also examines the mediating role of technology innovation in the relationship between interactivity and perceived risk.

3.1. The Effect of Interactivity on Perceived Risk

Interactivity is considered a form of social interaction that involves exchanges among users, either directly or virtually. Parents can obtain information through a variety of channels, including personal recommendations and online reviews [16]. Personal recommendations or face-to-face advice involve verbal communication and contribute significantly to influencing parents' decision-making process [16], [17].

Additionally, interaction through online reviews greatly increases access to valuable information by enabling users to share their experiences with a larger audience [18].

This interactive communication also helps parents gather recommendations, validate the quality of services, and access others' experiences, which collectively reduces the perceived risks associated with unregistered childcare centers. Past studies have found that interactivity is a powerful tool for reducing perceived risk and uncertainty for parents because interaction can foster trust and increase parents' confidence in decision-making [19]. However, the effectiveness of interactivity could become less if the message is not clearly understood by the audience [51].

H1: Interactivity has a positive and significant relationship with perceived risk.

3.2. The Effect of Technology Innovation on Perceived Risk

According to earlier research, parents use the Internet as supplementary tools to help them make decisions that lower perceived risk. Examples of these resources include websites about childcare providers in general, websites about specialized providers, and Ofsted assessments of nearby nurseries [20]. As a result, parents frequently turn to social networking sites to look for daycare because referrals from friends, neighbors, or relatives might not seem trustworthy or available to provide it [49]. Additionally, parents want to make sure that they choose the best childcare provider from among various options that carry different levels of risk. Moreover, this study argues that parents can choose safer childcare facilities for their children with the help of technology innovations like websites, social media platforms, and smartphone apps [43], [51].

H2: Technology has a positive and significant relationship with perceived risk.

3.3. The Effect of Interactivity on Technology Innovation

Parents frequently rely on personal recommendations and informal advice when searching for childcare centers [20]. Word-of-mouth occurs when parents interact with friends or acquaintances who have had similar experiences in seeking childcare [20]. For example, in a childcare choice study in England, parents combined various sources of information, but word-of-mouth remained the most important source [21].

Past studies have shown that preschool parents in Taiwan prefer interactive parenting apps for the useful information they provide, as these apps provide valuable insights into effective parenting strategies [9]. In addition, interactivity has a positive impact on individuals for exchanging ideas about a particular product, which is theoretically more effective than one-way communication [23]. Therefore, by showing how interactive platforms (like parenting apps) increase the value and adoption of technology for consumers, previous research supports the idea that interactivity has a positive and significant impact on technological innovation.

H3: Interactivity has a positive and significant relationship with technology innovation.

3.4. Technology Innovation Mediates the Relationship between Interactivity with Perceived Risk

The main role of technology today is to enhance and facilitate employment as well as to improve the social standards of living [45]. Internet technology has revolutionized and transformed the technological landscape as a tool for interaction in the modern era [46]. For instance, technology and two-way communication are essential components of an effective communication strategy for parents [47].

Past studies have shown that interactivity enhances the enjoyment for parents in the caregiving process, as well as it can provide significant benefits through mobile parenting practices [48]. For example, parenting apps offer strong social connectivity and effective communication through a user-friendly interface are very useful because they help users in parenting practices [48].

The use of technology to facilitate cross-cultural interaction parenting has been the subject of other studies [49]. Previous studies have shown that parents use internet technology to facilitate communication and select options that reduce perceived risk [20]. In addition, previous research has also used technology as a mediator between the intention to adopt it and its characteristic, such as perceived risk [52]. Similarly, in this childcare study, technological innovation can likewise mediate the relationship between perceived risk and interactivity.

H4: Technology innovation mediates the relationship between interactivity and perceived risk.

The following research framework is proposed (Figure 1). It links between interactivity on perceived risk and interactivity on technology innovation.

In addition, the model also shows the mediating effect between the variable.

Therefore, the development of the hypothesis was based on the research model and the recommendations from past studies.

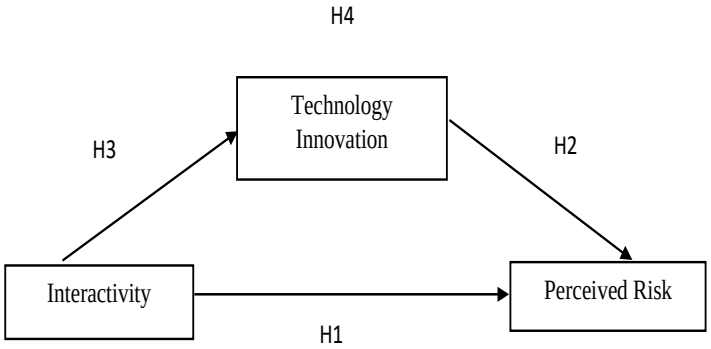

Figure 1. Research framework

4. Methodology

This section outlines the research methodology employed in the study, including the measurement instruments used to collect data and the sampling procedures, as well as demographic details of the respondents.

4.1. Measures

The information was gathered via survey questionnaire. The questionnaire consisted of items on demographic information, as well as Likert-scale questions measuring interactivity, technology innovation and perceived risk. Furthermore, the questionnaire was created specifically for this study served as the primary data gathering tool, and it was divided into two parts. In Part A, the questionnaire focused on collecting sociodemographic characteristics such as gender, age, race, religion, state of residence, educational background, number of children attending childcare, number of years using childcare services, type of childcare and household income. Meanwhile, part B of the questionnaire focused on the factors influencing parents' decisions regarding childcare, including interactivity (eight items) adapted from [24] and [25], technology innovation (five items) based on [24] and perceived risk (six items) adapted from [14].

4.2. Sample

For the population of this study, working mothers from Perak, Kelantan, Selangor, and Johor were selected due to high marriage statistics in these regions [9].

Questionnaire (n=450) were distributed to working mothers whose children, aged 0-4 years, were attending unregistered childcare centers. Out of the 450 questionnaires distributed, only 410 questionnaires were completed and returned. After initial screening, 407 usable responses were identified. Further data cleaning, which included the removal of outliers and responses with straight-lining patterns, a final dataset of (n=385) valid responses was retained for analysis. The measurements' descriptive statistics were assessed using SPSS statistics version 29. In particular, the study model was tested using a PLS-SEM technique utilizing Smart PLS version 4.

From Table 1, the respondents were exclusively female (100%), with the majority being Malay (97.4%) and 97.7% identifying as Muslim. The age distribution revealed that 83.4% of respondents were in the prime working and parenting age range of 26–35 years. Most respondents held a bachelor's degrees (56.1%), followed by those with diplomas (22.1%), reflecting a professional background that indicated a reliance on childcare services. Respondents were predominantly from Selangor (30.4%), Kelantan (24.4%), Johor (22.6%), and Perak (22.6%).

Regarding childcare, most respondents (62.1%) had 1–2 children attending unregistered childcare centers, with 26.8% having 3–4 children. The data showed that 65.5% had been using childcare services for 1–2 years, while a smaller portion had been using them for 3–5 years or more. The survey emphasized that all participants relied on unregistered childcare centers, highlighting the importance of this study. For the household income, the majority of respondents fell into the moderate-income range, with 43.9% earning between RM 3000 and RM 3999 and 23.4% earning RM 4000 and above.

Table 1. Background information of respondents

Demographic	Frequencies	Percentage (%)
Race		
Malay	375	97.4
Chinese	4	1.0
Indian	6	1.6
Religion		
Islam	376	97.7
Christian	4	1.0
Hindu	5	1.3
Age		
18 to 25 years old	4	1.0
26 to 30 years old	166	43.1
31 to 35 years old	155	40.3
36 to 45 years old	50	13.0
More than 45 years old	10	2.6
Education Level		
Primary education	1	0.3
Secondary education	3	0.8
Certificate	36	9.4
Diploma	85	22.1
Bachelor degree	216	56.1
Master degree	34	8.8
PhD	10	2.6
State of Residence		
Johor	87	22.6
Selangor	117	30.4
Perak	87	22.6
Kelantan	94	24.4
Number of Children Attending Childcare		
1-2	239	62.1
3-4	103	26.8
5-6	32	8.3
7 and above	11	2.9
Number of Years Using Childcare Services		
Less than one year	78	20.3
1-2 years	252	65.5
3-5 years	51	13.2
6-10 years	3	0.8
More than 10 years	1	0.3
Type of Childcare		
Unregistered	385	20.81
Household Income		
<RM 1000	7	1.8
RM 1000-RM 1999	18	4.7
RM 2000-RM 2999	101	26.2
RM 3000-RM 3999	169	43.9
RM 4000 and above	90	23.4

5. Results

The model fit index is deemed inadequate for model validation, as it fails to distinguish between model that is valid and model that is not valid [30], [26]. Therefore, this study uses a two-step approach to PLS-SEM path analysis, as proposed by [27], which includes the assessment of measurement model and the structural model [27], [30]. The method is frequently applied in PLS-SEM to ensure the validity and reliability of the model.

The first stage in the measurement model is to ensure that the measured indicators constructed are accurate, valid, and reliable. The significance of the path coefficient, R^2 and Q^2 are evaluated in the second phase of structural model evaluation. In summary, this two-step approach in PLS-SEM path analysis is crucial for verifying both the measurement and structural models, thereby ensuring the overall validity and reliability of the study's findings.

5.1. Measurement Model Assessment

The research model used in this study is validated by Smart PLS 4.0 [28], as this research analysis tool is widely used for PLS-SEM. This analytical methodology consists of two phases; it evaluates the measurement model before using the structural model, as shown by [29] study. This methodology is used to ensure that a thorough assessment of the validity and reliability of a construct can be carried out before analyzing the relationships between the construct.

The measuring model, depicted in Figure 2, is initially examined for convergent validity, internal consistency and discriminant validity.

In the second stage, the study will test the proposed relationships, evaluate model fit, and identify the statistical significance of the paths and the structural model. In addition, to guarantee reliable estimations of loadings and path coefficients, a bootstrapping technique with 10,000 resamples was employed.

In this model, all constructs are reflective, composed of several items that are highly correlated and represent a common underlying concept. This ensures the indicators consistently reflect the construct.

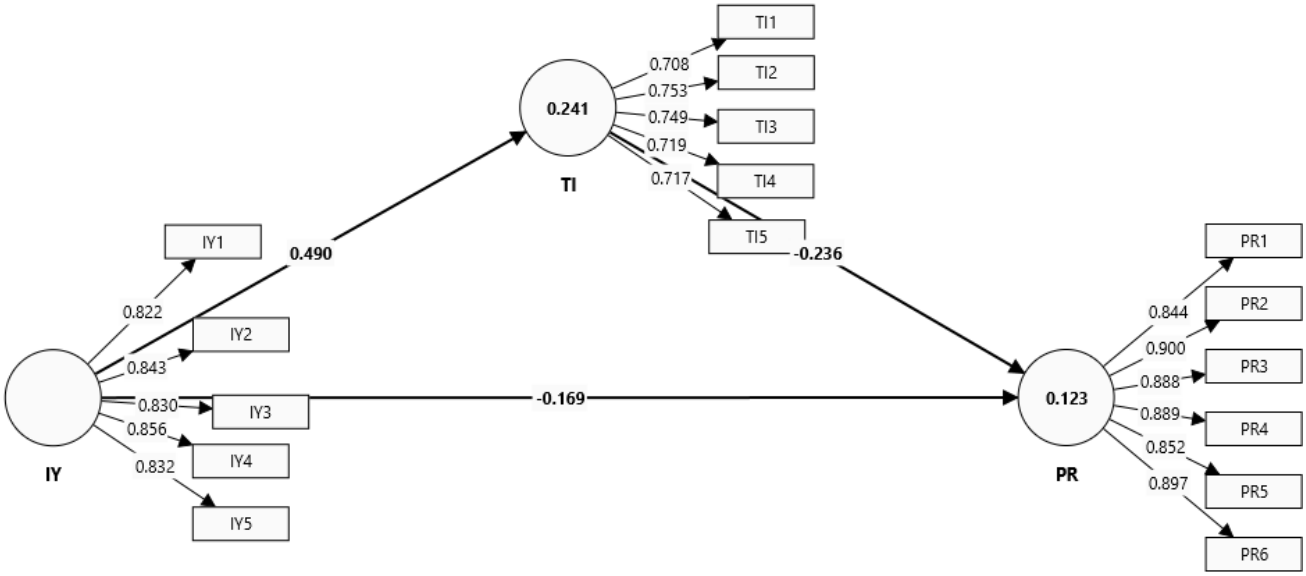

Figure 2. Measurement model first order construct

5.1.1. Estimate of Loadings and Significance

The assessment of the measurement model began with an examination of the outer loadings, as presented in Table 2, ranging from 0.704 to 0.900, indicating that all items effectively measured their respective constructs [30].

5.1.2. Indicator Reliability

The internal reliability was assessed through Cronbach's Alpha. As shown in Table 2, all factors demonstrated values exceeding 0.7, falling within the range of 0.780 to 0.942, indicating a satisfactory degree of consistency [31]. Constructs like Interactivity (IY) recorded an Alpha of 0.896, indicating strong reliability, while Perceived Risk (PR) had the highest Alpha of 0.942, reflecting exceptional reliability. Technology Innovation (TI), with an Alpha of 0.780, also demonstrated satisfactory reliability.

These findings confirm that all constructs show strong internal consistency, with no need to remove any items, ensuring accurate and reliable measurement for further analysis.

5.1.3. Composite Reliability

Composite Reliability (CR) assesses internal consistency by considering individual item loadings, offering a more precise evaluation [30]. CR can range between 0 to 1, which 0.60 is the minimum criteria [27]. Nonetheless, values 0.70 and above are generally accepted as evidence of good to strong reliability [30], [32]. It can be observed from Table 2, the CR values are ranging between 0.850 and 0.953, above the recommended range values. This condition provides evidence of the strength of the assessment model for further analysis, highlighting the reliability as well as consistency.

5.1.4. Convergent Average Variance Extracted (AVE)

Convergent validity verifies that each measurement item effectively represents its targeted construct. A latent variable is considered reliable is its average variance extracted (AVE) is greater than 0.5, signifying that the construct explains over 50% of the variance in its indicators and is well represented [27], [30].

Technology Innovation (TI) has an AVE of 0.533, Interactivity (IY) at 0.700, and Perceived Risk (PR) achieving the highest at 0.772 (Table 2). These results affirm that the constructs demonstrate adequate convergent validity, ensuring reliability and distinction in the measurement model [27], [30].

Table 2. First-order constructs measurement model

Construct	Items	Loadings	VIF	Cronbach Alpha	AVE	CR
Interactivity (IY)	IY1	0.821	3.753	0.896	0.700	0.921
	IY2	0.843	3.306			
	IY3	0.829	3.541			
	IY4	0.857	2.909			
	IY5	0.833	2.670			
Technology Innovation (TI)	TI1	0.710	1.429	0.780	0.533	0.851
	TI2	0.756	1.580			
	TI3	0.731	1.493			
	TI4	0.722	1.518			
	TI5	0.729	1.433			
Perceived Risk (PR)	PR1	0.846	2.963	0.942	0.772	0.953
	PR2	0.900	3.592			
	PR3	0.889	3.225			
	PR4	0.893	3.387			
	PR5	0.842	2.624			
	PR6	0.898	3.525			

5.1.5. Discriminant Validity

Discriminant validity indicates that the latent variables in a model are truly distinct and capture unique concepts without overlapping with each other [38]. It is assessed using two main approaches: The Fornell-Larcker method [36] and the heterotrait-monotrait (HTMT) ratio, both of which offer strong tests of construct distinctiveness [34], [35].

Based on Table 3, all constructs in this study exhibit AVE square roots **(highlighted in bold)** that surpass their respective correlations with other constructs, indicating that discriminant validity has been effectively established [37].

The HTMT ratio further complements this assessment by evaluating the ration of correlations between distinct constructs (heterotrait) to those within the same construct (monotrait). A ratio below 0.85 is recommended [38], though some studies accept a threshold of 0.90. Table 4, showing that all constructs in this study are quite different from each other, confirming that all constructs meet the HTMT threshold.

Together, these results indicate that the model has a high level of discrimination, confirming that each construct is deemed adequate for subsequent analysis [35], [37].

Table 3. Discriminant validity – Fornell and Larker Criterion

	IY	PR	TI
IY	**0.837**		
PR	-0.284	**0.879**	
TI	0.490	-0.314	**0.730**

Table 4. Discriminant validity – HTMT

	IY	PR	TI
IY			
PR	0.310		
TI	0.549	0.356	

5.2. Structural Model Assessment

The second technique for evaluating structural models is covered in this part; it evaluates the models' capacity to forecast at least one target constructs [30]. The study employed 385 cases and 10,000 subsamples to evaluate whether the path coefficient is statistically significant [27], [37]. The structural model was assessed to ensure it could accurately examine the links between the constructs, as illustrated in Figure 3.

This requirement is used to make the structural model is consistent with the theoretical framework and offers trustworthy insights validated by data.

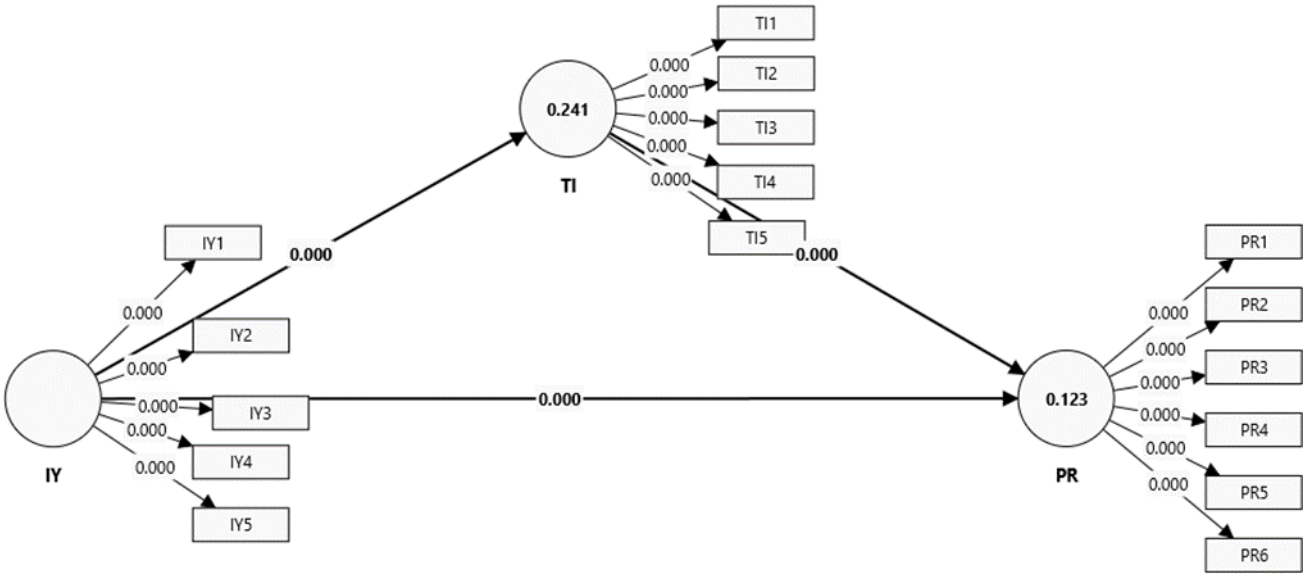

Figure 3. Structural model

5.2.1. Direct Relationships

Each path relationship in the model is evaluated and the proposed hypothesis is tested using bootstrapping procedures. This nonparametric approach in PLS-SEM involves generating bootstrap samples by repeatedly resampling from the original dataset, enabling the calculation of standard errors for hypothesis testing [39].

In addition, reporting path coefficients, standard errors, t-values above (>1.645) and p-values below (<0.01) were all taken into account in this study using a bootstrapping resampling method of 10,000 samples [30], [33]. Table 5 combines the results and describes the criteria used for hypothesis testing.

Table 5. Hypothesis testing

Hypothesis	Relationship	Beta	Standard deviation (STDEV)	T-statistics	P values	R^2	Decision
Hypothesis 1	IY > PR	-0.169	0.039	4.347	0.000	0.123	Accepted
Hypothesis 2	TI >PR	-0.236	0.045	5.185	0.000		Accepted
Hypothesis 3	IY > TI	0.490	0.037	13.115	0.000	0.241	Accepted

By examining the findings, the study uncovers the factors influencing unregistered childcare centers. As a result, they can reduce Perceived Risk (PR). Additionally, this study has shown a significant relationship between Interactivity (IY) and Technological Innovation (TI), and it also offers a method to mitigate perceived risks.

For H1, Interactivity (IY) had a significant negative relationship with PR ($\beta=-0.169$, $p<0.01$) and an R^2 of 0.123, indicating that interactivity contributes to reducing perceived risks. This suggests that fostering open communication and engagement between parents and childcare providers plays a crucial role in alleviating parental concerns.

Similarly, H2 demonstrated that Technology Innovation (TI) negatively influences PR ($\beta=-0.236$, $p<0.01$) with an R^2 of 0.123, meaning TI explains 12.3% of the variance in PR.

While the adoption of technology, such as digital surveillance or safety apps, helps mitigate perceived risks, its effect is relatively modest compared to interactivity.

H3 demonstrated that interactivity positively influences Technology Innovation (TI), showing that Interactivity (IY) strongly predicts Technology Innovation (TI) ($\beta=0.490$, $p<0.01$) with an R^2 of 0.241, indicating that interactive relationships between parents and childcare providers account for 24.1% of the variance in TI. This suggests that promoting active communication and engagement can drive technological advancements in unregistered childcare centers.

In conclusion, all hypotheses were supported, showing that interactivity reduces perceived risk (H1), technology innovation helps reduce perceived risk (H2), and interactivity drives technology innovation (H3) in unregistered childcare centers.

5.2.2. Mediation Effect

The study examined the indirect effects of Interactivity (IY) on Perceived Risk (PR) through Technology Innovation (TI), using bootstrapping to test the mediation hypotheses. These hypotheses aimed to explore how various factors influence the reduction of perceived risks in unregistered childcare centers by encouraging technological adoption (Table 6).

H4 indicates that Interactivity (IY) increases Technological Innovation (TI) and reduces Perceived Risk (PR).

A significant indirect effect was observed (β=−0.051, p=0.023), supported by a confidence interval that did not straddle zero (LL = -0.096, UL = -0.009). These findings support H4 and confirm how important interactivity such as open communication between parents and childcare providers is. Additionally, technological advancements in interactions help reduce the perceived level of risk. Furthermore, the study found that Technological Innovation (TI) is important in equalizing interactions (IY) and Perceived Risk (PR) in unregistered childcare centers.

Table 6. Hypothesis testing

Hypothesis	Relationship	Beta	Std Error	T Values	P Values	LL	UL	Decision
Hypothesis 4	IY → TI → PR	-0.116	0.025	4.631	0.000	-0.169	-0.072	Accepted

5.2.3. Assessment of Predictive Relevance (Q2)

This study employed the Q^2 test, as introduced by [40] and [41]. According to the Stone-Geisser standard, the interior model must demonstrate its ability to predict endogenous latent construct indicators [27]. Therefore, a second assessment for prediction relevance was carried out using the blindfold process and the Stone-Geisser test for both examinations [27]. To calculate the Q^2 value, the Stone-Geisser test and the validated cross-redundancy measures for endogenous latent constructs were used [35]. Table 7 shows the values for Technological Innovation (TI) and Perceived Risk (PR) as components of cross-validated redundancy measures.

All values for the Q^2 are above zero, as shown in Table 7. This implies that the model has a significant predictive relationship. Notably, the TI value of 0.126 and the PR of 0.085 are both above zero. The analytical values show that the model can predict these endogenous latent structures. This is due to the fact that Q^2 values show a forecast correlation higher than zero, while values below zero indicate a lack of correlation [27]. These results show that the model can effectively predict TI and PR outcomes and establish predictive validity.

Table 7. Predictive relevance (Q^2)

Total	SSO	SSE	Q^2 (=1-SSE/SSO)
TI	1925	1683.35	0.126
PR	2310	2113.05	0.085

6. Discussion

The findings of this study demonstrate that all four tested hypotheses were supported, indicating significant relationships among Interactivity (IY), Technological Innovation (TI), and Perceived Risk (PR) in the context of unregistered childcare centers.

Research shows that Interactivity (IY) can reduce risk (H1).

According to earlier research, interactive communication boosts confidence and trust while making decisions [16], [19]. Furthermore, research has demonstrated a strong inverse relationship between perceived risk and technology innovation (TI) (H2). This is consistent with earlier studies that demonstrate how technology, including websites and mobile applications, can help parents to make better decisions and lowering uncertainty [42], [44]. As a result, parents' worries regarding the safety and quality of childcare services are reduced due to the new chances for real-time monitoring and feedback made possible by the integration of digital platforms. Additionally, this makes crucial information more accessible.

Furthermore, this study demonstrates that interactivity has a positive effect on technological innovation (H3). These results are supported by previous research on the value of parenting interactive apps in facilitating important social engagement and interaction [22]. However, mediation analysis (H4) shows that technological innovation is an important avenue where interactivity influences perceived risks. These findings show how important interactivity and interconnected technologies are to create a safer and more transparent childcare environment. These results align with previous research on how technology mediation influences strategies for mitigating risk [49].

Finally, the findings of this study produce information that can help parents make decisions and create safer and healthier childcare. The study will also improve children's well-being and school readiness. The study also confirms the role of interactivity, technological innovation, and perceived risk in childcare supervision. Therefore, organizations need to improve the technology used to meet their needs such as increasing productivity, improving quality, and integrating processes. They should also make continuous monitoring of technology and train their staff to be more efficient [50].

7. Conclusion

This study aims to determine the effect of interactivity and technological innovation on perceived risk among parents in childcare service decision-making, specifically within the context of unregistered childcare centers in Malaysia. Based on the data collected from 385 working mothers, this study revealed that technological innovation and interactivity significantly affected perceived risk. Furthermore, technological innovation was found to have a direct negative relationship with perceived risk and acted as a significant mediator between interactivity and perceived risk.

As a recommendation, this study suggests that childcare providers and policymakers should implement strategies and platforms that facilitate interactivity among relevant parties, enhance the Standard Operating Procedures (SOPs) for childcare providers, and encourage the use of innovative technology, such as developing applications to create safer and more trustworthy childcare centers.

Despite achieving the minimum sample size, this study acknowledges several limitations. The study was limited to four states, namely Selangor, Kelantan, Johor and Perak, which may not capture regional differences across the entire country. Furthermore, the model only examined the interactivity and technology innovation as predictors of perceived risk, without incorporating with other potentially influence factors. Nonetheless, this study contributes meaningfully to the understanding of how interactivity and technology innovation shape parents' perception of risk in the childcare context.

Future research is encouraged to explore additional predictors such as customer reviews and regulatory awareness, and to examine whether technological innovation continues to mediate the relationship in different childcare settings.

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