

ELUCIDATING FACTORS AFFECTING PARENTAL ADOPTION INTENTION OF IOT ENABLED CHILD SMART TRACKING WEARABLES

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Abstract

With the growing concerns around child safety, IoT enabled child tracking wearables offers a smart and practical solution for parental supervision and child protection. These smart technology devices utilize GPS and wireless connectivity to offer real time location monitoring and safety alerts. Understanding the growing need of such child safety technologies, this study investigates the factors that influences intention of parents to adopt IoT enabled child smart tracking wearables.

Mixed Method approach was used to explore the factors that influences the choice of parents to adopt smart wearables for their kid's safety. For developing the initial framework of the study, six in-depth interviews were conducted, wherein four mothers and two fathers were interviewed to understand what drives them to use the CGM trackers based smart wearables for their kids. Each interview lasted for 40-50 mins. Post that a rigorous review of past literature was done providing a strong base for developing the research model and identify the indicators for the survey instrument. Inputs from 346 parent (mothers or fathers), was generated and used for study. The integrated model developed for the study was adopted from theories of TAM, UTAUT and Protection Motivation Theory (PMT) and was adjusted to sync with the context of smart wearables for child safety. It consisted of seven latent constructs influencing the attitude of parents for the smart wearables, which in turns influences the adoption intention of parents. All the seven constructs Performance Expectancy, Perceived Ease of Use, Perceived Reliability, Compatibility & Integration, Trust, Parental Anxiety, Social Influence were found to positively influence the attitude towards wearables and their adoption intention. Technology Innovativeness and Cost Factor were significantly moderating the adoption intention of the parents. The study revealed that Parental Anxiety, Perceived Reliability and Performance Expectancy were the key drivers of parental intention to adopt the IoT enabled child wearables to monitor and track their kids' activity and movement.

The research results offer inputs for the Wearable manufacturers to design very reliable, secure and user-friendly child tracking smart wearables. Also, it offers a practical guide to marketers and policy makers to focus on the key drivers like Perceived Reliability and Performance Expectancy to enhance the adoption rate of the child safety technologies.

Keywords: Smart Wearables, Child Tracking devices, IoT devices, Child Security, Parental Control, Child Safety Technologies

INTRODUCTION

The digital advancement and improved Internet of Thing (IoT) application has changed the landscape of smart wearables and their application, particularly in the context of real time tracking and child safety [19], [13]. These smart wearables use the advance integrated technologies of GPS monitoring, Bluetooth, Wi-Fi and cellular communication to offer child safety assurance in the form of continuous location tracking, geo-fencing and emergency alerts [3]. Wearable trackers in the form of smartwatches and wrist band for kids majorly below the age of 13, offers parent's, the peace of mind and sense of security [17].

With the ever-increasing concern around child safety due to rising cases of child abduction, and unlawful acts, particularly in urban set up calls for some advanced technological solution [15]. The traditional security and surveillance measures to keep children safe are no more effective and urges for more dynamic and real time tracking and monitoring systems. IoT

enabled child tracking wearables are the boons for parents, offering features like SOS button, geo-fencing, two- way communication and movement history log.

To understand user adoption perspective, it's crucial to understand parental attitude and factors driving their adoption choices. Past studies have confirmed that, parents are motivated to explore and adopt these child safety devices, provided that they perceive the technology beneficial, reliable, ease to use, and socially acceptable [20],[22]. Design and aesthetics, privacy measures, convenience, battery life are also other factors impacting parental decisions [17], [6], [12]. Despite these past studies on smart wearable there is gap in the literature, mostly with regards to the child safety tracking functionality, a major concern for parents. Furthermore, the existing research pin point more on the functional drivers and technology adoption aspect, often undermining the emotional or psychological factors such as parental anxiety and trust. With this background, this study attempts to bridge this gap by investigating the role of emotion and phycological drivers together with functional factors, presenting the holistic understanding of the adoption of the child tracking wearables.

THEORITICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

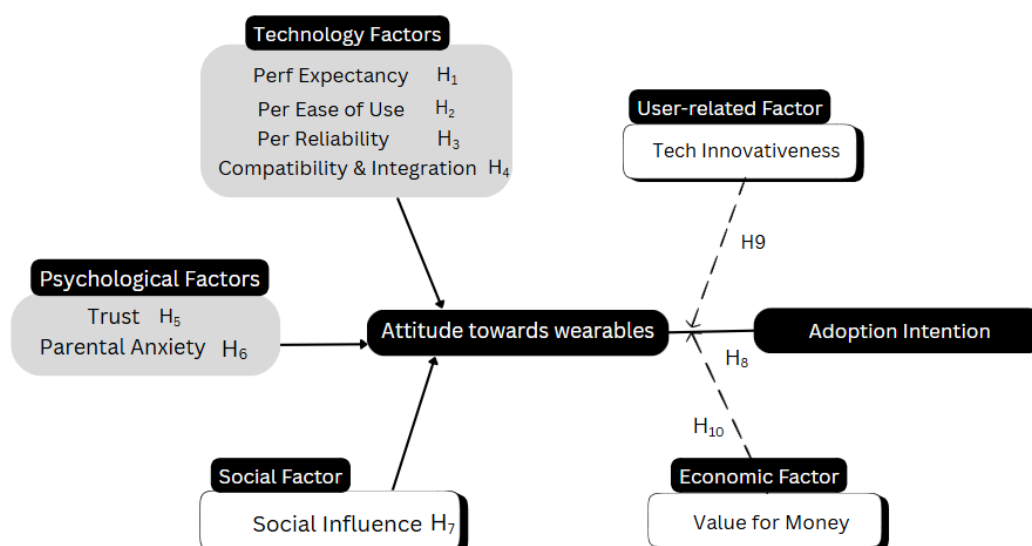


Fig1: Child Tracking wearables Adoption Intention: Proposed Research Model

The study presents the adoption model of child tracking wearables based on the integration on the technological acceptance and behavioral intention models. The proposed research model is adopted from TAM [7], UTAUT [21] and Protection motivation Theory (PMT) [16] with the extension which includes constructs addressing psychological and emotional factors like parent anxiety, trust and cost benefit analysis.

2.1 PERFORMANCE EXPECTANCY (H1)

PE refers to the user's perception on how the new technology would be addressing their functional expectation, how effective and beneficial it would be [19]. In this study, it focuses on the parental perception on how the child tracking wearable will offer them the solution of child real time tracking and ensure their child safety. H1: Performance Expectancy positively affects the attitude towards adoption of child tracking wearables

2.2 PERCEIVED EASE OF USE (H2)

Adapted from technology acceptance theory (TAM), it implies the user friendliness of IoT

based tracking wearables [7]. How convenient and simple interface the wearables will offer to them for easy monitoring and tracking.

H2: Perceived ease of use positively impacts the attitude towards adoption of child tracking wearables

2.3 PERCEIVED RELIABILITY (H3)

Reliability demonstrates the parents' confidence that the tracking safety wearable will perform effectively and consistently without any error. It plays a very crucial role in impacting parents' choice to try and adopt the technology [22].

H3: Perceived reliability positively affects the attitude towards adoption of child tracking wearables

2.4 COMPATIBILITY AND INTEGRATION (H4)

Compatibility and integration indicate, how compatible the wearable devices are with the individual needs, experience [4]. and other technological ecosystems like mobile phones, smart watches etc. The devices integration with other technologies is very critical for ensuring its effectiveness in maintaining child security.

H4: Compatibility and integration positively affect the attitude towards adoption of child tracking smart wearables

2.5 TRUST

Parental trust in wearable technology plays a very critical role in influencing their attitude and adoption intention [9]. How trustworthy and secure they find the wearable devices are for their little one's safety, together with the assurance of maintaining the data privacy is foundational for their decision.

H5: Trust positively affects the attitude towards adoption of child tracking smart wearables

2.6 PARENTAL ANXIETY

Parental anxiety is a dominant driver of the child safety wearable adoption. Parents emotional vulnerability and overwhelming concern for their children drives them to seek technological solutions [22], [11]. With real time updates and location tracking and activity monitoring features these wearables ensure child safety, bringing them peace of mind.

H6: Parental anxiety positively affects the attitude towards adoption of child tracking smart wearables

2.7 SOCIAL INFLUENCE

Social Influence reflects the degree of influence of family, friends and peers have on individuals' decision [21]. In the context of child safety wearables, the recommendation from someone from the social circle, and parents' social media communities impact parents' decision strongly in terms of seeking these safety devices for their child.

H7: Social Influence positively affects the attitude towards adoption of child tracking smart wearables

2.8 ATTITUDE TOWARDS WEARABLES (H8)

Attitude as a mediating variable influences the relationship between the perception and parental adoption intention of the safety wearables [2].

H8: Attitude towards wearables positively affects the adoption intention of child tracking smart wearables

2.9 TECH INNOVATIVENESS (H9)

Parents with high appetite of technology proactiveness and innovation are more likely to seek the technological assistance [1], the IoT based tracking wearable offer.

H9: Tech Innovativeness positively affects the adoption intention of child tracking smart wearables

2.10 VALUE FOR MONEY (H10)

Value for money implies the cost benefit analysis done by individuals of the new technological solution. Parents perception of the value, emotional as well as functional value they seek from the wearables and the price of the devices, significantly impacts their adoption decision of the child tracking wearables [24].

H10: Value for money positively affects the adoption intention of child tracking smart wearables

METHODS

Mix method approach was used for the study, wherein two stage process was adopted. Stage one was to develop the preliminary understanding of the research area, which started with six in-depth interviews of the parent which included four mothers and two fathers. The interviews were of semi-structured nature and after seeking the consent from respondents, each interview was recorded, transcribed and analyzed using NVivo software. With the inputs received from IDI's and review of past literature an integrated research model was developed from TAM, UTAUT and PMT theories.

Stage two started with the designing of the questionnaire, wherein the indicators for the ten latent constructs were adopted from the validated scales from the theories of TAM, UTAUT and PMT, adjusted well to suit the context of child tracking wearables. The latent constructs of the research model were Performance Expectancy, Perceived Ease of Use, Perceived Reliability, Compatibility & Integration, Trust, Parental Anxiety, Social Influence, Attitude Towards Wearables, Adoption Intention of the parents with Technology Innovativeness and Cost Factor as the moderators. The response of the items was recorded on seven-point Likert scale, and the instrument was validated by the subject area experts, also to test the internal reliability of the instrument, pilot testing was done with 25 responses.

After freezing the questionnaire, it was rolled online via social media, primarily through online parents' communities on Facebook and WhatsApp groups. The eligibility criteria for the respondents were set to be a parent either mother or father of 1 or more children in the age group of 3 to 13 years. 435 responses from all over India were generated, from September 2024 to Feb 2025, with 346 responses usable for the analysis giving response rate of 79.54.

For analysis of the data SPSS version 25 and Smart PLS 3.2.7 was used. Descriptive analysis and reliability testing using Cronbach's alpha was done using SPSS and for the measurement model and structural modelling PLS SEM [8], [10] was used.

IV RESULT & DISCUSSION

To test proposed research model and hypothesis, analysis was done in two stages. Stage 1 was to test the validity and reliability of the latent constructs and indicators. It was found that the outer loading of all the indicators was greater than 0.70, confirming the indicator reliability. To

measure the internal consistency, Cronbach's alpha (Hair, J. F. et al., 2016; Fornell, C et al., 1981) and composite reliability testing was done, resulting in all values within acceptable limit of greater than 0.70. Also, convergent validity was assessed via average variance extracted (AVE) with values greater than 0.50. [8], [10].

Stage 2 of the analysis was to test the structural model through proposed hypothesis. The result (Fig 2) supported all the ten hypothesis (Table 1). Analysis demonstrated that all the seven latent constructs Performance Expectancy ($\beta = 0.651$, $p < 0.005$), Perceived Ease of Use ($\beta = 0.514$, $p < 0.005$), Perceived Reliability ($\beta = 0.673$, $p < 0.005$), Compatibility & Integration ($\beta = 0.543$, $p < 0.005$), Trust ($\beta = 0.541$, $p < 0.005$), Parental Anxiety ($\beta = 0.721$, $p < 0.005$), Social Influence ($\beta = 0.612$, $p < 0.005$), positively influences the Parents Attitude Towards Wearables ($\beta = 0.514$, $p < 0.005$), which in turns positively impacts the adoption intention of child tracking wearables. These findings are consistent with past studies emphasizing on the importance of perceived usefulness, trustworthiness of the technologies, ease of use in positively influencing the adoption of emerging technologies [21], [23].

Out of the seven constructs positively influencing the adoption attitude and intention, Parental Anxiety, Perceived Reliability and Performance Expectancy were found to be the important drivers of parental adoption intention the IoT enabled child tracking wearables. to monitor and track their kids' activity and movement and ensure their safety.

Parental anxiety ($\beta = 0.721$) emerged as the most dominant driver, due to the amount of stress parents go through when their child is in the new and unsupervised setup. Parents emotional vulnerability and overwhelming concern for their children drives them to seek technological solutions. With real time updates, location tracking and activity monitoring features these wearables ensure child safety, bringing them peace of mind. This is in alignment with past studies [22],[14] which have significantly focused on the role of emotional drivers, categorically role of fear and concern for child safety can influence the adoption intention of new technologies. Child safety tracking wearable is the technology which is not just the functional tech device but the emotional support system for the parents. Therefore, by addressing the psychological and emotional concerns of the parents, the wearables adoption rate can be enhanced.

Perceived Reliability ($\beta = 0.673$) and Performance expectancy also plays an important role in shaping parents' attitude and intention to adopt tracking wearables. Parents perception that the wearable devices will function accurately and consistently [19]. and the confidence they have in the technology that it will offer an effective monitoring and protective solution for their child [20],[22] enhances their adoption rate.

Overall findings concludes that the emotional factors like parental anxiety, technology trustworthiness and its effective functioning are critical to parents for exploring the child tracking wearables options and the possibility of adopting the technology to ensure their child safety.

Hypothesis	Relationship	Beta	STDEV	T values	P values	Result
H1	PE -> ATT	0.651	0.143	4.552	0	Supported
H2	PEOU -> ATT	0.514	0.132	3.894	0	Supported
H3	PR-> ATT	0.673	0.084	8.012	0.027	Supported
H4	CI-> ATT	0.543	0.153	3.549	0.031	Supported
H5	TRST -> ATT	0.541	0.113	4.788	0	Supported
H6	PA -> ATT	0.721	0.104	6.933	0	Supported

H7	SI-> ATT	0.612	0.112	5.464	0.014	Supported
H8	ATT -> AI	0.514	0.067	7.672	0	Supported
H9	TI -> AI	0.643	0.089	7.225	0	Supported
H10	VFM -> AI	0.61	0.071	8.606	0	Supported

Table1- Path Coefficients

4.1 Moderating Effect

Technology innovativeness ($\beta = 0.643$, $p < 0.005$) and value for money $\beta = 0.611$, $p < 0.005$), significantly moderates the relationship between the attitude and adoption of child safety wearables. Parents with high appetite of technology proactiveness and innovation are more likely to seek the technological assistant [1], the IoT based tracking wearable offer. Also, value for money [24], parents' perception of the value, emotional as well functional value they seek from the wearables significantly impacts their adoption decision of the child tracking wearables.

THEORETICAL AND PRACTICAL IMPLICATIONS

This study offers a new insight to the existing literature in the form of the adoption model for IoT enabled child safety wearables. The model integrated the emotional and psychological driver such as parental anxiety, trust with the functional factors of performance expectancy and perceived reliability. Also, it brought together the role of parent's technology innovativeness and their cost-benefit analysis in determining their adoption intention. With this, it has presented a holistic understanding of the parental adoption drivers of IoT enable child safety tracking wearables. Also, it offers a practical guide for developers, manufacturers and marketers of the child safety tracking wearables. Highlighting the wearables functionality, reliability, usability, trust, parental anxiety, social influence, it offers the complete manual for child safety wearable manufacturers and marketers. Furthermore, while deciding on the price points of the device, perceived value for money must be considered for parent seeking value. Focus on these factors can significantly enhance the wearables adoption rate.

CONCLUSION

The study examined the factors influencing the parental adoption intention of IoT enabled child safety tracking wearables, uncovering the integrated role emotional and functional drivers. The results demonstrated the strong influence of constructs like parental anxiety, perceived reliability and performance expectancy on building the positive attitude and adoption intention of child safety wearables. By validating all the proposed hypothesis, the study offers research evidence on how parents, attitude and adoption intention of smart safety technologies are influenced. These insights offer a comprehensive picture of parental adoption behavior in a IoT enabled child safety context.

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